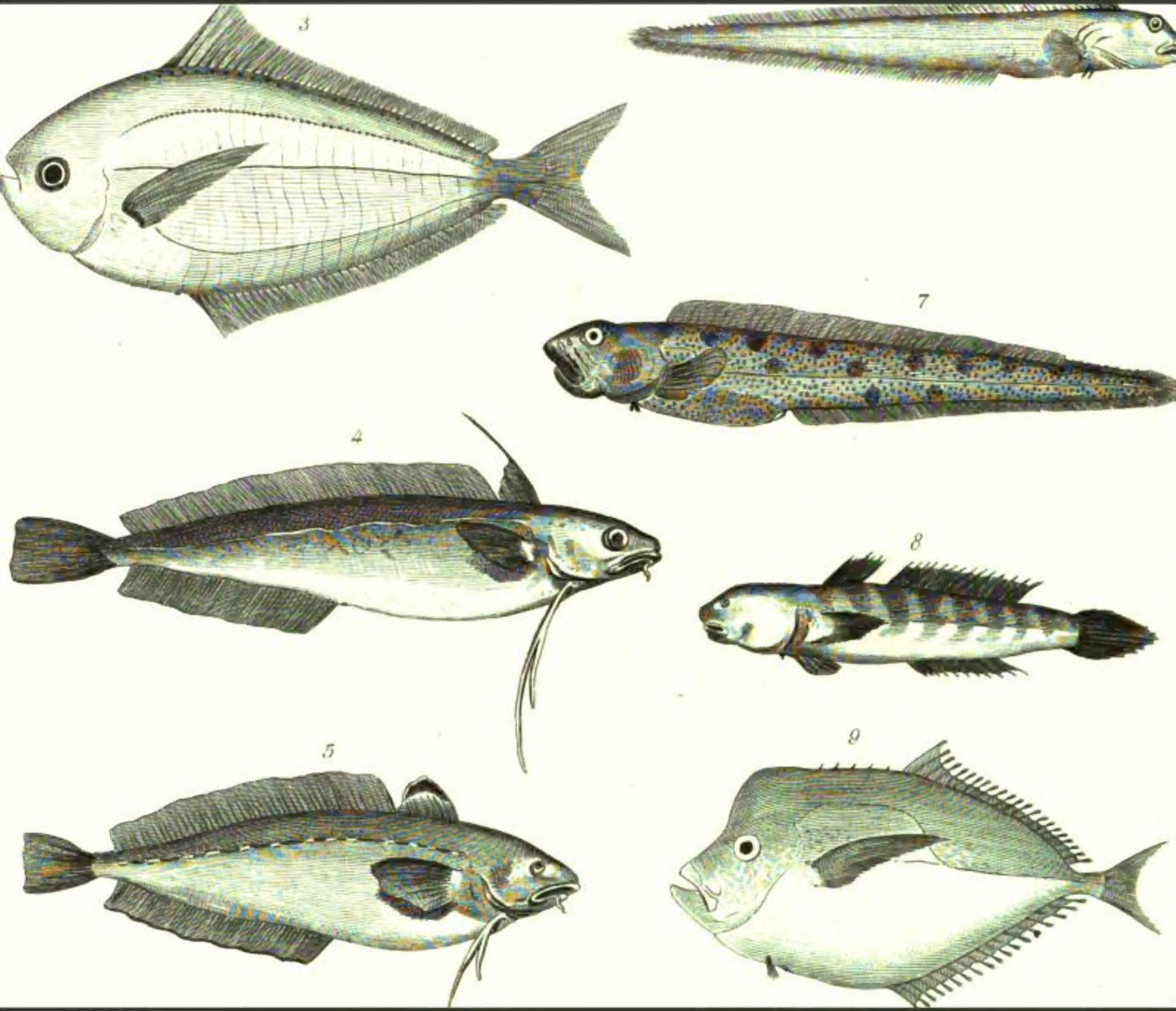

Transactions of the Literary and Philosophical Society of ...

Literary and Philosophical Society of New-York (New York, N.Y.)

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TRANSACTIONS

OF THE

LITERARY AND PHILOSOPHICAL SOCIETY

OF

NEW-YORK:

INSTITUTED IN THE YEAR MDCCCXIV.

VOLUME I.

NEW-YORK:
PUBLISHED FOR THE SOCIETY, BY VAN WINKLE AND WILEY,
Corner of Wall and New Streets.
....
1815.

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TRANSACTIONS.

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NOTICE.

The First Volume of the Transactions *of the* Literary *and* Philosophical Society *of* New-York, is now, with due deference, submitted to the Public.

Besides the eloquent and elaborate Introductory Discourse of the President, this volume will be found to contain such Communications, from its different members, as have from time to time been read before the Society since its organization in 1814, and which have been considered worthy of preservation in a printed form. In the Selection of Papers for the press, the Counsellors, to whom that office pertains, have directed their views solely to the intrinsic merits of the several Memoirs submitted to them; and the Society here wish it to be distinctly understood, that they now disclaim, and ever shall, all responsibility as to the verity of facts, or the soundness of the speculations contained in the Communications they may publish: These must rest with their respective authors.

In the disposition of Papers the Committee of Publication for this Volume have had regard chiefly to the order of time in which the different Communications were read before the Society.

New-York, August 1st, 1815.

DR. HUGH WILLIAMSON,
DR. DAVID HOSACK,
JOHN PINTARD,

Committee of Publication for Volume First.

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AN ACT

TO

INCORPORATE THE LITERARY AND PHILOSOPHICAL SOCIETY, OF NEW-YORK.

PASSED MARCH 25, 1815.

WHEREAS the members of a Literary and Philosophical Society, instituted in the city of New-York, have petitioned for an act of incorporation, and the Legislature, considering it their duty to encourage all laudable attempts to promote the useful arts, to diffuse knowledge, and to enlighten the human mind: Therefore,

Be it enacted by the people of the state of New-York, represented in Senate and Assembly, That De Witt Clinton, James Kent, David Hosack, John M. Mason, Josiah Ogden Hoffman, Hugh Williamson, Samuel Latham Mitchill, Wright Post, Cadwallader D. Colden, Brockholst Livingston, Thomas Eddy, John Bowden, Peter Wilson, Charles Wilkes, Robert Fulton, Peter Augustus Jay, John H. Hobart, Archibald Bruce, Robert Adrain, William James M'Neven, Nathaniel Bowen, John C. Osborn, Frederick W. Geisenhaimer, William Johnson, John Pintard, John Anthon, Jacob Van den Heuvel, John W. Francis, Alexander M'Leod, Thomas R. Mercein, James S. Stringham, John Griscom, James Renwick, John A. Smith, Lewis Simond, Richard Riker, Thomas Y. How, William Harris, Andrew Ellicott, Jacob Morton, Rufus King, Richard Harison, Samuel Bard, Gouverneur

Morris, Thomas Addis Emmet, John Wells, John Stevens, John R. Murray, Simeon De Witt, Samuel Jones, jun. David B. Ogden, Benjamin De Witt, Samuel F. Jarvis, Gulian C. Verplanck, Samuel Harris, Samuel Akerly, William Sampson, and such other persons as now are, and may from time to time become, members of the said society, shall be, and hereby are, constituted a body coporate and politic by the name of "THE LITERARY AND PHILOSOPHICAL SOCIETY OF NEW-YORK," and that by that name they shall have perpetual succession, and shall be persons capable of suing and being sued, pleading and being impleaded, answering and being answered unto, defending and being defended in all courts and places whatsoever, and may have a common seal, with power to change or alter the same from time to time, and shall be capable of purchasing, taking, holding, and enjoying, to them and their successors, any real estate in fee-simple or otherwise, and any goods, chattels, and personal estate, and of selling, leasing, or otherwise disposing of the said real and personal estate, or any part thereof, at their will and pleasure; *Provided always*, that the clear annual value or income of such real and personal estate, shall not exceed the sum of five thousand dollars: *Provided, however*, that the funds of the said corporation shall be used and appropriated to the promotion of the objects stated in the preamble to this act, and those only.

And be it further enacted, that the said society shall, from time to time, for ever hereafter, have power to make, constitute, ordain, and establish such by-laws and regulations as they shall judge proper for the election of their officers, for prescribing their respective functions, and the mode of discharging the same; for the admission of new members; for the government of the officers and members thereof; for collecting annual contributions from the members toward the funds thereof; for regulating the times and places of meeting of the said society; for suspending

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or expelling such members as shall neglect or refuse to comply with the by-laws or regulations; and for the managing and directing the affairs of the said society: *Provided* such by-laws and regulations be not repugnant to the constitution and laws of this state, or of the United States.

And be it further enacted, that the officers of the said society shall consist of a president, three vice presidents, twelve counsellors, two recording secretaries, two corresponding secretaries, one treasurer, two curators, and such other officers as the society may judge necessary, who shall be annually chosen, and who shall continue in office one year, or until others shall be elected in their stead; that if the annual election shall not be held at any of the days for that purpose appointed, it shall be lawful to make such election at any other day, and that nine members of the said society, of whom the president, or one of the vice presidents, shall be one, assembling at the place and time designated for that purpose by any by-laws or resolutions of the society, shall constitute a legal meeting thereof.

And be it further enacted, that De Witt Clinton shall be the first president, James Kent, David Hosack, and John M. Mason, the first vice presidents, Josiah Ogden Hoffman, Brockholst Livingston, Robert Fulton, Robert Adrain, William Johnson, Cadwallader D. Colden, Archibald Bruce, Peter Augustus Jay, John Bowden, Peter Wilson, Wright Post, and William James M'Neven, the first counsellers; Hugh Williamson and Samuel Latham Mitchill, the first corresponding secretaries; Jacob Van den Heuvel and James Renwick, the first recording secretaries; John Pintard and John W. Francis, the first curators; and Thomas Eddy, the first treasurer; who shall hold their respective offices until the second Thursday of January next, and until others shall be chosen in their places.

And be it further enacted, that this act is hereby declared to be a public act, and that the same shall be construed in all courts favourably and benignly, for every beneficial purpose therein intended, and that no misnomer of the said corporation in any deed, gift, grant, demise, or other instrument of contract or conveyance shall vitiate or defeat the same: *Provided* the corporation shall be sufficiently described to ascertain the intention of the parties.

State of New-York, Secretary's Office.

I certify the preceding to be a true copy of an original act of the Legislature of this state on file in this office. March 26, 1814.

ARCHIBALD CAMPBELL,
Deputy Secretary.

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THE

LAWS AND REGULATIONS

OF

THE LITERARY AND PHILOSOPHICAL SOCIETY,

OF NEW-YORK.

THERE shall be One President, Three Vice Presidents, Twelve Counsellors, Two Corresponding Secretaries, Two Recording Secretaries, Two Curators, and One Treasurer.

ART. I. In the absence of the President, one of the Vice Presidents shall take the chair, and in their absence, the oldest Counsellor present shall preside.

ART. II. All the officers of the society shall be chosen annually, by ballot, and the annual election shall be on the second Thursday of January in each year; and every choice shall require a majority of the votes.

ART. III. If any officer of the Society, the President and Treasurer excepted, shall absent himself from four successive meetings of the Society, (unless detained by sickness, or absence from the city, of which he shall give notice,) he shall be considered as having vacated his office, and another shall be chosen in his place.

ART. IV. There shall be a stated meeting of the Society on the second Thursday of every month, and nine members shall be sufficient to constitute a quorum.

ART. V. There shall be four quarterly meetings of the Society; viz. on the second Thursday in January, April, July, and October.

ART. VI. The election of members shall be by ballot, at one of the quarterly meetings, and at no other time; and no candidate shall be elected, unless he obtains the votes of three fourths of the members present at the election.

ART. VII. There shall be two classes of members, distinguished as resident and honorary. All members who reside in the state of New-York shall be deemed resident members, and all others shall be called honorary.

ART. VIII. No person shall be eligible as an honorary member who has not been distinguished by his attainments in science, or his literary publications.

ART. IX. Before any member is elected, he must be recommended by at least two members of the Society, at a previous stated meeting.

ART. X. If a candidate who lives in the city of New-York be chosen, he shall, before he becomes a member, sign his name in a book kept for that purpose, declaring his assent to the laws and regulations of the Society, and shall pay ten dollars as his fee of admission, until otherwise directed by the Society.

ART. XI. All members of the Society residing in the city of New-York, shall pay into the hands of the Treasurer five dollars annually, until the Society shall otherwise order; nor shall any member have the privilege of voting at any election of officers or members, who is in arrears for his admission money, or his annual contributions.

ART. XII. It shall be the duty of the Council to propose such additional laws and regulations as to them may appear necessary or useful in conducting the business of the Society, and such laws and regulations being by them agreed to and presented to the Society, shall be considered at the next quarterly meeting.

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Art. XIII. No purchase, nor any disposition of money or property belonging to the Society, can be made, except by the advice of the Council.

Art. XIV. All communications that may be made to the Society shall, in the first instance, be referred to the Council for consideration. Those communications shall be classed under one of the following heads:

1st. Belles-lettres, Civil History, Antiquities, Moral and Political Sciences.

2d. Medicine, Chemistry, Natural Philosophy, and Natural History.

3d. Mathematics, Astronomy, Navigation, and Geography.

4th. Husbandry, Manufactures, and the Useful Arts.

The Council, having formed itself into four classes, shall commit the several communications to one of those classes, whose duty it shall be to report on the same.

Art. XV. It shall be the duty of the Council to select, from time to time, from the papers that shall have been read before the Society, and submitted to their consideration, such as may appear most worthy of publication, and to determine, with the concurrence of the other officers of the Society, what papers shall be published: but the Society is never to be considered as expressing an opinion in favour of the facts stated, or reasoning contained, in such papers.

Art. XVI. It shall be the duty of the Recording Secretaries to read all communications to the Society, and to keep a journal of their proceedings, and upon the election of a member who resides in the city or state of New-York, it shall also be their duty to give to the member so elected, a notice of the same in a printed letter.

Art. XVII. When an honorary member may be chosen, it shall be the duty of the Corresponding Secretaries in like manner to give him notice of his election.

Art. XVIII. The Curators shall have the care of the library, specimens of natural history, models of instruments and machines, and of such other matters belonging to the Society as may be committed to them.

Art. XIX. The Treasurer shall discharge the duties incident to such office in similar cases.

Art. XX. The duties of the officers shall be more particularly defined in the by-laws.

MEMBERS

OF

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OF

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* Those members to whose name this (*) mark is prefixed are deceased.

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Caspar Wistar, M. D. President of the American Philosophical Society, Professor of Anatomy in the University of Pennsylvania.

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ANNO 1814.

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Thomas Eddy, Treasurer.

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Jacob Van Den Heuvel, Esq

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John Pintard, A. M.
John W. Francis, M. D.

Thomas Eddy, Treasurer.

---

[*] Died 23d February, 1815, and Rev. Samuel Jarvis, A. M., elected to the office in May ensuing.

[†] Resigned in March 1815; and John W. Francis, M. D., elected a Recording Secretary in June following.

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AN

INTRODUCTORY DISCOURSE,

DELIVERED ON

THE 4th OF MAY, 1814,

BY

DE WITT CLINTON, LL.D.

PRESIDENT OF THE LITERARY AND PHILOSOPHICAL SOCIETY OF NEW-YORK.

AN

INTRODUCTORY DISCOURSE, &c.

In compliance with the solemnity expected on this occasion, I rise to address this respectable audience. For the first time has an association been established and incorporated in this state, devoted to literature and philosophy. Although I have always ardently cherished the love of letters, yet I am fully sensible that neither my attainments nor my talents entitle me to this place. On my zeal and my industry, however, the fullest reliance may be placed; for, although not a minister officiating at the holy altar of science, yet you shall always find me a sincere and humble worshipper at the vestibule of the temple. It is with societies as it is with individuals; if the first impression be favourable, it gives a tone to character which is attended with the most auspicious effects in every future stage of existence: As somewhat of the colour of our social character may depend on this first appearance on the theatre of public observation, you may judge of my embarrassment on this occasion.

The solemn considerations which grow out of an establishment of this nature must press upon our sensibility with redoubled force, when we reflect upon the accusations which are brought against our country by the literati of Europe. The celebrated Buffon has declared that, in

America, animated nature is weaker, less active, and more circumscribed in the variety of its productions, than in the old world; that there is some combination of elements and other physical causes, something that opposes its amplification; that there are obstacles to the development, and perhaps to the formation, of large germs, and that even those which, from the kindly influences of another climate, have acquired their complete form and expansion, shrink and diminish under a niggardly air and an unprolific land! Dr. Robertson has also said, that "the principle of life seems to have been less active and vigorous here than in the ancient continent;" and that "nature was not only less prolific in the new world, but she appears likewise to have been less vigorous in her productions." Need we add to this the obloquy which has been cast upon our country by the herd of tourists and travellers who have attempted to describe it. With some of them, our soil is destitute of prolific power, our atmosphere teems with disease and death, our lives are comparatively short, our institutions are tottering under debility and decay, our national character is marked with all the traits of premature corruption and precocious turpitude, our manners are barren of refinement, and our minds are destitute of learning, and incapable of great intellectual exertion. When we adventure into the fields of science, the master spirits who preside over transatlantic literature view us with a sneer of supercilious contempt, or with a smile of complaisant superiority, and consider our productions as oases in the regions of Africa, deriving their merit less from intrinsic beauty and excellence, than from their contrast with the surrounding deserts. And it has even been gravely proposed as a subject for inquiry, whether the discovery of America has been advantageous or prejudicial to mankind![*]

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[*] See Note A.

While we look down upon these aspersions, it is due to candour, and a just estimate of our own character, to acknowledge that, generally speaking, we are far behind our European brethren in the pursuits of literature. The enterprising spirit, which distinguishes our national character, has exhibited itself in every shape except that of a marked devotion to the interests of science. There is nothing in the fixed operation of physical or moral causes, nothing in our origin, in our migration, or in our settlement; nothing in our climate, our soil, our government, our religion, our manners, or our morals, which can attach debility to our minds, or can prevent the cultivation of literature. Two hundred years have nearly elapsed since the first European settlement was made in this state; and if, in the course of two centuries, labouring under difficulties of various kinds, we have not attained the first elevation in the ranks of knowledge, surely sufficient reasons may be assigned without impeaching the character of our minds, or degrading us in the scale of being. Although in a review of these causes, which I shall now attempt with all possible brevity, my remarks relate particularly to this state, they will apply, generally speaking, to the United States at large.

Ancient migrations were generally the offspring of want. Sometimes a whole people departed from their natal soil, and sought for better destinies in a milder climate, and a more prolific land. Sometimes, when population became surcharged, and subsistence difficult, a portion of a nation would change its habitation: at other times, colonies were planted for the purpose of retaining conquered countries, and checking the predatory incursions of barbarian hordes. A different principle seems to have led to the first colonization of America. The discovery of this western world appears to have infused a new spirit into Europe: the imaginations of men were dazzled with fabulous stories of dorados, or mountains of gold, and of fountains by which the human race flourished in immortal youth. In this land the god of wealth was supposed to have

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erected his temples, and his votaries flocked from all quarters to propitiate his blessings. When experience had sobered the distempered fancies of these adventurers, and had convinced them of their delusion, they still discovered that, although the precious metals were not within their grasp, yet that their cupidity could be amply gratified by the abundant products of the soil. The settlement of this country was thus made with a view to the acquisition of wealth; knowledge was out of the question. The attachments of the emigrants, like their origin, were exotic; the land of their adoption was considered as secondary and inferior in every respect to the land of their nativity; and their anxious eyes were constantly directed to the period when they could return to their native soil, laden with the bounties of the new world. This country was also planted at a time when the intellectual world was involved in Cimmerian darkness. The scholastic philosophy was the reigning knowledge of the times—a philosophy of words and notions, conversant only in logical distinctions, abstractions, and subtleties, which left real science wholly uncultivated to hunt after occult qualities, abstract notions, and objects of impertinent curiosity. This system, which was founded by the commentators on Aristotle, who were called profound, irrefragable, and angelic doctors, corrupted every department of knowledge, and maintained its supremacy for several centuries. The Stagyrite was even considered as entitled to the honours of an evangelist, and Melancthon complains that his ethics were read to the people instead of the gospel, in sacred assemblies. In this great Sorbonian bog the human mind lay ingulfed, entranced, and bewildered for ages; and the glimmering rays of light which the peripatetic philosophy shed over the world, were confined to the cloister and the college. At this period this country was first settled by the countrymen indeed of Erasmus and of Grotius; but the works of Erasmus were locked up in Latin—Grotius was scarcely known, and few of our ancestors were acquainted with the first elements of knowledge.

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They settled here under the auspices of a Dutch West-India Company, and when the province was surrendered to the English, in 1674, no advantages resulted to the cause of knowledge. Charles II. was a witty sensualist—James II. was a contracted bigot—William of Orange was a mere soldier. The constellation of intellectual luminaries which shone in the Augustan age of England diffused but little light across the Atlantic: the two first of the Brunswick kings had neither knowledge themselves, nor did they value it in others; and with the third of that dynasty we measured swords, and a severance of the empire ensued.

There is something in the nature of provincial government which tends to engender faction, and to prevent the expansion of intellect. It inevitably creates two distinct interests; one regarding the colony as subservient in every respect to the mother country, and the other rising up in opposition to this assumption. The governor and principal magistrates, who derive their appointments from an extrinsic source, feel independent of the people over whom they are placed. The operation of this principle has been powerfully experienced in our territorial governments, which have been the constant theatre of intestine divisions; and when the human mind is called away from the interests of science to aid, by its faculties, the agitations of party, little can be expected from energies thus perverted and abused. The annals of our colonial state present a continual controversy between the ministers of the crown and the representatives of the people. What did the governor and judges care for a country where they were strangers; where their continuance was transient, and to which they were attached by no tie that reaches the human heart. Their offices emanated from another country—to that source they looked for patronage and support, to that alone their views extended; and having got what Archimedes wanted, another world on which to erect their engines, they governed this at pleasure.

The colonial governors were, generally speaking, little entitled to respect. They were delegated to this country, not as men qualified to govern, but as men whose wants drove them into exile; not as men entitled by merit to their high eminence, but as men who owed it to the solicitations of powerful friends, and to the influence of court intrigue. Thus circumstanced and thus characterized, is it wonderful to find them sometimes patrolling the city disguised in female dress; at other times assailing the representatives of the people with the most virulent abuse, and defrauding the province by the most despicable acts of peculation, and at all times despising knowledge and overlooking the public prosperity? Justice, however, requires that we should except from this censure Hunter and Burnet. Hunter was a man of wit, a correspondent of Swift, and a friend of Addison.* Burnet, the son of the celebrated Bishop of Salisbury, was devoted to literature; they were the best governors that ever presided over the colony.

The love of fame is the most active principle of our nature. To be honoured when living—to be venerated when dead—is the parent source of those writings which have illuminated—of those actions which have benefited and dazzled mankind. All that poetry has created, that philosophy has discovered, that heroism has performed, may be principally ascribed to this exalted passion. True it is,

> "When fame's loud trump hath blown its noblest blast,
> Though long the sound, the echo sleeps at last;
> And glory, like the phœnix 'midst her fires,
> Exhales her odours, blazes, and expires."
> Lord BYRON.

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* See Note B.

Yet, as long as man is susceptible of sublime emotions, so long will he commit himself to this master feeling of a noble nature. What would have become of the sublime work of Milton, if he had written for the fifteen pounds which he received from the bookseller; and where would have been the writings of Bacon, if he had not aspired to immortal fame. "My name and memory," said this prince of philosophers, in his will, "I leave to foreign nations and to my own countrymen after some time be passed over." When with one hand he demolished the philosophy of the schools, and with the other erected a magnificent temple dedicated to truth and genuine knowledge, he was animated in his progress, and cheered in his exertions, by the persuasion that after ages would erect an imperishable monument to his fame.

But in order that this passion may have its full scope and complete operation, it is not only necessary that there should be a proper subject, but a suitable place, and an enlightened public. The actor, in order to act well his part, must have a good theatre and a respectable audience. Would Demosthenes and Cicero have astonished mankind by their oratory, if they had spoken in Sparta or in Carthage? Would Addison have written his Spectators in Kamtschatka, or Locke his work on the Understanding at Madrid? Destroy the inducement to act, take away the capacity to judge, and annihilate the value of applause, and poetry sinks into dulness, philosophy loses its powers of research, and eloquence evaporates into froth and mummery.

A provincial government, like ours before the revolution, was entirely incompetent to call into activity this ennobling propensity of our nature. A small population, scattered over an extensive country, and composed almost entirely of strangers to literature, a government derivative and dependent, without patronage and influence, and in hostility to the public sentiment, a people divided into political and religious parties, and a parent country watching all their movements with a stepmother's feelings, and keeping down their prosperity with the arm of power, could not be expected to produce those literary worthies who have illuminated the other hemisphere.

History justifies the remark, that free governments, although happier in themselves, are as oppressive to their provinces as despotic ones. It was a common saying in Greece, that a freeman at Sparta was the freest man, and a slave the greatest slave in the world. This remark may be justly applied to the ancient republics which had provinces under their control. The people of the parent country were free, and those remote were harassed with all kinds of exactions, borne down by the high hand of oppression, and under the subjection of a military despotism. The colonial system of modern times is equally calculated to build up the mother country on the depression of its colonies. That all their exports shall go to, and all their imports be derived from, it, is the fundamental principle. Admitting occasional departures from this system, is it possible that an infant country, so bandaged and cramped, could attain to that maturity of growth which is essential to the promotion and encouragement of literature? Accordingly, we do not find in any colony of modern times any peculiar devotion to letters, or any extraordinary progress in the cultivation of the human mind. The most fertile soil—the most benign climate—all that nature can produce and art can perfect, are incompetent to remove the benumbing effects which a provincial and dependent position operates upon the efforts of genius.

These difficulties, so embarrassing, were augmented from other causes. The population of this colony was derived from several nations. The original emigrants were Dutch. The next in order of time were from England. The revocation of the edict of Nantz, and the persecutions in the Palatinate, occasioned considerable migrations from France and Germany: Scotland and Ireland also furnished a great accession of inhabitants. Four different languages were for a long time used, and the people were separated from each other by a diversity of manners and opinions, and strong natural prejudices. How, then, was it possible to combine their energies in any common effort? Two centuries have not entirely extinguished the lines of national separation. The Dutch and German languages are still spoken in some settlements. Five or six generations have, in a great measure, amalgamated these discordant elements. National antipathies have subsided, a national character has been formed, and a national physiognomy is supposed to be established. The triumph and general adoption of the English language have been the principal means of melting us down into one people, and of extinguishing those stubborn prejudices and violent animosities which formed a wall of partition between the inhabitants of the same land. In a country whose population was thus composed, it was not to be expected that a great taste for literature would be considered an essential accompaniment.

The government of Great Britain discountenanced emigrations. Transportation to the colonies was declared to be the punishment for many felonies. "It is a shameful and unblessed thing," said Bacon, "to take the scum of people, and wicked, condemned men to be the people with whom you plant; and not only so, but it spoileth the plantation." This measure was, no doubt, the result of design, the dictate of policy. It inculcated upon the public mind that the colonies were a place of punishment, not a country enjoying the blessings of life; and it prevented that copious flow of migration which the necessities of the people, and the hope of enjoying better fortunes in another land, would have unquestionably effected. Although the relegation of convicts to this country could not seriously affect the morals of the American people, or materially disturb their internal tranquillity, yet it certainly injured our character in the general estimation of Europe. The British government has established one great settlement for convicts; there can be

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little doubt but that the same sentiment existed at one period, in the old world, with respect to this country, as now prevails here in relation to Botany Bay: and what respectable man could be induced to remove to that place? What encouragement would it afford to the cultivation of literature? The Pierian Spring and the Parnassian Mount are not to be expected in the Den of Cacus. The idea of a country appropriated as the residence of men whose lives have been polluted with crimes, is associated with all that is shocking and appalling; and we consider it in the same light as the poet represents the entrance into the infernal regions:

> " Luctus, et ultrices posuêre cubilia curæ;
> Pallentesque habitant morbi, tristisque senectus,
> Et metus, et malesuada fames, et turpis egestas;
> Terribiles visu formæ! Lethumque, laborque;
> Tum consanguineus Lethi sopor, et mala mentis
> Gaudia; mortiferumque adverso in limine bellum,
> Ferreique Eumenidum thalami, et discordia demens,
> Vipereum crinem vittis innexa cruentis."
>
> ÆNEID, lib. VI.

The combined and pernicious effects of this complication of causes, were to be traced in the general want of education—in the debased condition of the learned professions—in neglect of seminaries of learning—and in a universal apathy with regard to the interests of science.

The influence of printing upon knowledge is well understood. During the Dutch government no press was established. Governor Dongan was instructed, in 1686, to allow no printing press in the province. The first established was in 1693, and the first newspaper published was on the 16th of October, 1725.

Whatever may be thought of the following remarks of Sir William Temple in other respects, their justice, in relation to the medical profession, must be universally acknowledged. "It is certain, however," says that distinguished writer, "that the study of physic is not achieved in any eminent degree without very great advancements in the sciences; so that, whatever the profession is, the professors have been generally very much esteemed on that account as well as of their own art, as the most learned men of their ages, and thereby shared with the two other great professions in those advantages most commonly valued, and most eagerly pursued; whereof the divines seem to have had the most honour—the lawyers the most money—and the physicians the most learning."

Hippocrates was profoundly skilled in natural knowledge before he commenced the study of medicine; and it has become a common saying that, where the natural philosopher ends the physician begins. The laws which regulate other material substances, apply to the human body. Chemistry is all essential to a physician. "I do not hesitate to pronounce," said Fourcroy, "that modern chemistry has done more, in twenty years, for medicine, than all the united labours of preceding ages." The materia medica is supplied from the three kingdoms of nature. Without a knowledge of botany, mineralogy, and zoölogy, a physician cannot understand the medicines he prescribes; and as the nomenclature of his profession is derived from the learned languages, and principally from the Greek, he ought to be a classical scholar. In a word, he should have a general acquaintance with all the departments of human knowledge, in order to compose that learned man which is expected from an able and accomplished physician.

With this elevated idea of the medical character, how must we be mortified to find the low state of the profession during the greater period of the colonial government. It was totally unregulated; and the apothecary, physician, and surgeon, were united in the same individual. "Quacks," said the colonial historian, "abound like locusts in Egypt." A periodical writer, who published in 1752, estimated the number of families in this city to be two thousand, and the number of physicians to be forty, which would make one physician for every fifty families; and he further stated that he could show, by "probable arguments, that more lives are destroyed in this city by pretended physicians, than by all other causes whatever."* Nor was the profession of the law on a more respectable footing. As there was no distinction of degrees, the attorney and the counsellor were blended together, and the profession was disgraced by the admission of men not only of the meanest abilities, but of the lowest employments.

While the theological profession exhibited a more respectable appearance from the transatlantic education of many of our divines, the state of our seminaries of learning displayed a most humiliating spectacle. "Our schools," says the colonial historian, "are in the lowest order. The instructors want instruction, and through a long, shameful neglect of all the arts and sciences, our common speech is extremely corrupt, and the evidences of a bad taste, both in thought and language, are visible in all our proceedings, public and private:" and, at that time, there were instances of some magistrates who were totally ignorant of the first rudiments of instruction.

Amidst the intellectual darkness which covered the land, some corruscations of light were to be seen darting through the gloom. A prolific soil and an enterprising spirit had, in some degree, surmounted the disadvantages of a colonial state, and the general ease and plenty which prevailed through the province called off the attention of many from the pursuits of laborious occupations to the cultivation of the mind. The value of education was estimated as the privation of it was experienced, and many young men were sent to the colleges of the eastern colonies,

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* Independent Reflector.

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Nisus (among Philosophers) an inclination of one body towards another. See Bailey's Dictionary of 1759

and to the universities of Great Britain, for the benefits of education. Some of our lawyers were brought up in the Inns of Court, and some of our physicians were instructed in the celebrated schools of London and Edinburgh.

This nisus of the human mind, to emancipate itself from the slavery of ignorance, appeared in a variety of other shapes. In 1754 a public library was founded in this city. On the 31st of October, in the same year, King's (now Columbia) College received its charter, and the first commencement was held in 1758. A faculty of medicine was annexed to that institution in 1769, and Clossy, Bard, Jones, and Middleton, men of great eminence, were appointed to direct its destinies. A general taste for science and literature began to exhibit itself. At the head of those distinguished men, who devoted themselves to the interests of knowledge, may be justly placed Cadwallader Colden, a man of great mental acumen, and of extensive acquirements: he was, for a long time, lieutenant governor of the province; and he spent a great portion of a long life in the cultivation of letters, and in a literary correspondence with Linnæus, Franklin, and the other illustrious savans of the age. He illustrated the botany of this country, composed many interesting works, was intimately acquainted with the Newtonian philosophy, and was learned in his profession as a physician. A history of the colony was written by William Smith, whom Dr. Robertson has denominated the ingenious historian of New-York. Attempts were made to emulate the periodical writings which adorned the literature of Great Britain. In 1752 several weekly essays were published under the title of the Independent Reflector. Although at this day there appears nothing exceptionable in them, yet they did not suit the temper of the times; they excited the resentment of some of the leading men, and a clergyman denounced the writer from the pulpit, and compared him to Gog and Magog. The printer was finally menaced into a discontinuance of

the publication, and it expired with the 52d number. In 1755 a series of well-written essays, under the title of the Watch Tower, was published in the New-York Mercury, printed by Hugh Gaine.

The public attention was, however, principally engrossed in religious controversies. In the time of Governor Fletcher the episcopalians were favoured with a partial establishment in this and three of the neighbouring counties. This exceptionable measure excited much uneasiness, and a proposition to establish bishops in America, although reasonable in itself, was resisted with great zeal, and produced a long and violent polemic war, which was conducted with great talents. Our Dutch ancestors were agitated about a question relative to their own church; whether their clergy might be ordained in this country without the sanction of the Classis of Amsterdam: and the French and presbyterian churches were also torn asunder by internal feuds.

Some of these jealousies and controversies affected literary objects, and procrastinated, for a considerable time, the establishment of a college. Pamphlets were written, not only as to the government, but the site, of the institution—whether it should be under the control of a particular sect—whether it should be in the city or county, were questions debated with great earnestness. Although these agitations had a beneficial effect in exciting the mind to action, yet it is to be regretted that such talents and powers were expended in a way so little calculated to subserve the solid interests of science. From this barren soil no substantial harvest of improvement could be reaped; and if the same quantity of intellect, which has been appropriated to unproductive and interminable controversies, had been applied to the promotion of genuine science, the boundaries of knowledge would have been greatly enlarged, and the honour and happiness of the human race would have been essentially promoted.

Mental, in many cases, acts directly the reverse of corporeal, vision, and magnifies objects, not in proportion to their propinquity, but in the ratio of their distance. This obliquity of the human mind springs from a variety of causes, and operates in a variety of directions. It incessantly magnifies the talents and morals of the past, at the expense of the present times, and its wanderings never appear in a more striking view than in its judgments of men. By its magic influence the dwarf of antiquity starts up into a giant; and like the phenomenon called the Mirage, it translates the men and the things of this earth to the skies. These remarks are made, not to depreciate those who have gone before us, but to warn us not to depreciate ourselves. The panegyrics which have been pronounced upon the works of some of our predecessors, appear strange when we consider their writings with an unprejudiced mind: and, perhaps, the same observation may, without arrogance, be applied to many of the divines, the physicians, the jurists, and the statesmen whose praises have reached us through the organ of tradition, and whose memories have descended to us adorned with the laurels of genius: but let not this discourage exertion—what they are to us, many of you will deservedly be to future generations; and the pious feelings of posterity may cherish your worth with equal ardour, and embalm you in their hearts with equal affection.

The spring which was given to the human mind; the improvement which seminaries of education produced; and the general, extensive, and augmented popularity of intellectual illumination, paved the way for those political discussions which ushered in the American revolution, and finally dismembered the British empire. The study of the law, as a liberal profession, necessarily leads to investigations with regard to the origin of government, the constitutions of states, and the objects of jurisprudence. The influence of this profession upon the political events of the times could not escape the sagacity of Burke: he assigns it as one of the causes of the revolution. "This study," says he, "renders men acute, inquisitive, dexterous, prompt in attack, ready in defence, full of resources. In other countries, the people, more simple, and of a less mercurial cast, judge of an ill principle in government by an actual grievance: here they anticipate the evil, and judge of the pressure of the grievance by the badness of the principle; they augur misgovernment at a distance, and snuff the approach of tyranny in every tainted breeze."*

The statesmen who appeared at the dawn of the revolution attracted the admiration of Europe; and the masterly state papers which our state convention and the general congress promulgated, breathed the genius of Greece, and the invincible spirit of Rome, and covered with glory the American name. "When," said the elder Pitt, "when your lordships look at the papers transmitted us from America—when you consider their decency, firmness, and wisdom, you cannot but respect their cause, and wish to make it your own. For myself, I must declare and avow that in all my reading and observation—and it has been my favourite study, (I have read Thucidydes, and have studied and admired the master states of the world,) that, for solidity of reasoning, force of sagacity, and wisdom of conclusion, under such a complication of difficult circumstances, no nation or body of men can stand in preference to the general congress at Philadelphia."†

The convulsions, devastations, and horrors which attended the revolution, were ill calculated to cherish the interests of science. Our seminaries of education were broken up, and all our attention was occupied in resisting the calamities which pressed upon our country.

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* Speech on Conciliation with America.

† Speech on a Motion to remove the Troops from Boston.

The restoration of peace opened brighter prospects; but an unsettled government, and a variety of other obstacles, prevented, for a time, much attention to literature. In imitation of the Royal Society of London, which was established at the close of the civil wars, an attempt was made to found a philosophical society in this city, in 1784; but it perished in embryo. King's College was revived, on the 13th of April, 1784, under the name of Columbia College. Union College was founded in 1795. Hamilton College, in 1812, and there are now near forty incorporated academies dispersed over the state, which probably contain about three thousand scholars. A Botanic Garden was founded in the vicinity of this city in 1801.* A College of Physicians and Surgeons was established in this city in 1807,† and another has been recently instituted, in the county of Herkimer. The medical profession has been regulated and placed on a respectable footing. Theological seminaries of great merit have been founded. The profession of the law has also been attended to; regular examinations are necessary to insure admission; the degree of counsellor has been separated from the vocation of attorney, and able reports of the decisions of the superior courts are regularly published. A Society for the Promotion of Agriculture, Arts, and Manufactures, was instituted in 1791; and in 1804 it was reorganized under the name of the Society for the Promotion of Useful Arts: its meetings are held at Albany during the sessions of the legislature; and under the auspices of its late and much-lamented presiding officers, Livingston and L'Hommedieu, and several other public-spirited men, it has published many valuable papers, and has greatly improved the agriculture of the state. An Historical Society was also incorporated in 1809, and an Academy of Fine Arts in 1808; which have made valuable appropriate collections, and which want nothing but more encouragement from the public, and more attention from the members, to become highly useful to the community.* Several works of great usefulness have been published, among which the Medical Repository, the American Medical and Philosophical Register, and the Mineralogical Journal, hold distinguished rank. And we have several intelligent and enterprising booksellers, the natural and efficient patrons of literature in all countries.

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* See Note C.

† See Note D.

A vast fund, amounting to a million and a half of dollars in value, has been appropriated to the support of common schools, and that wonderful improvement, the Lancasterian system, has obtained a firm footing. Our academies and colleges are well endowed, and the blessings of education are generally diffused, and, to a considerable extent, within the reach of the poorest children in the community.

But, although there is a vast mass of knowledge spread over the state, yet it is, generally speaking, of the common kind: all know the elementary parts of instruction, but few know the higher branches of science; and there is not so much concentrated knowledge in so many individuals as in Europe. This arises from a number of causes which do not disparage our intellectual character, and which, it is to be hoped, will cease to operate after a short time.

In the first place, we have, with scarcely any intermission, been distracted by party spirit, in its bitterest forms of exacerbation. Our ingenuity has been employed, not in cultivating a vernacular literature, or in increasing the stock of human knowledge, but in raising up and pulling down the parties which agitate the community. This violent spirit has split society asunder, has poisoned the intercourse of private life, has spread a morbid gloom over our literature, has infected the national taste, and has palsied the general prosperity. Whatever apologies may be made for these political discussions, by ascribing them to an honest difference in opinion, there can be none offered for the style and manner in which they are conducted. In reading the classical works of the ancients, we are astonished at the violations of decorum which appear in their most polite and accomplished authors, who frequently use expressions that no modern writer dare adopt without the certainty of condemnation. But if we excel the ancients in this respect, we are far behind them in other branches of literary good morals. The style of our political writings has assumed a character of rude invective, and unrestrained licentiousness, unparalleled in any other part of the world, and which has greatly tended to injure our national character. This has principally arisen from the indiscriminate applause that has been conferred upon certain eminent political writers. We imitate what we are taught to admire, and unfortunately we have aped their boldness of invective, and fierceness of denunciation, without exhibiting those fascinations of genius, which operate like the cestus of Venus, conceal deformity, and heighten all the charms of beauty and grace. Junius arose in the literary, like a comet in the natural, world, menacing pestilence and war, and denouncing, in a style of boldness and invective before unknown and unheard of, the constituted authorities of Great Britain. When we analyze his writings, we find no extraordinary power of imagination—no uncommon extent of erudition—no remarkable solidity of reasoning. His topics are few; but he was master of his subject. He possessed, in a singular degree, the vivida vis animi:* his conceptions were distinct and luminous, and he expressed them with peculiar point and sententious compression; but the polished keenness of his invective

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* See Note E.

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* Lucretius.

[illegible]

too often degenerated into vulgar scurrility. His importance was greatly enhanced by the mystery which surrounded his person—the panic which followed his denunciations—and the celebrity which was attached to his literary antagonists. He created a new æra in political writing; his works have become the architype and the text book of political authors; and every juvenile writer, who enters the political lists, endeavours to bend the bow of Ulysses, and in striving to make up in venom what he wants in vigour, mistakes scurrility for satire, ribaldry for wit, and confounds the natron of Egypt with the salt of Attica.

Secondly; after expressing my profound regret that those exalted and highly cultivated minds which have been engaged in polemic controversies, had not bent more of their attention to literary investigations, I consider it my duty to remark, with every sentiment of respect and regard, that the medical profession, instead of making one harmonious and undivided effort in favour of enlarging the dominion of knowledge, have hitherto been called away from this opus basilicum, this sublime operation, by the prevalence of intestine feuds and animosities. It is unnecessary to explore the cause; perhaps it is inherent in the profession. The sources of most diseases are concealed from observation, and can only be the subject of conjecture. Add to this, that the same prescription which has succeeded in one case, may fail in another, owing to different constitutions, different seasons, and the action of other causes. "The matter is evident," says the profound Buffier, "from the different arguments of physicians, and from their various opinions in the daily consultations. Nothing is more uncommon than to find physicians united in the same sentiments."* This constant and habitual tendency to collision has been seriously felt in this city. Instead of erecting one grand temple dedicated to the healing art, we have had, at one time, three different seminaries in operation for medical instruction.

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* Treatise on First Truths, p. 60.

Thirdly; there have been great inertness and backwardness, on the part of the legal profession, to encourage general literature. After the forms of a preliminary education are passed, the lawyer is too apt to devote himself exclusively to the learning of his profession; and, as many of our lawgivers and statesmen are derived from this source, we cannot but perceive and regret this dearth of general knowledge in our legislatures, as well as in our forums. How seldom do we hear those classical allusions, those literary references, which enliven the tedium of abstract discussion, and illustrate, with streams of light, the darkest topics of investigation! and this defect is exhibited in many of our state papers, which resemble more the technical discussions of the advocate, than the luminous productions of the diplomatist. The greatest intellectual luminary that ever rose in a benighted world was Francis Bacon, a lawyer by profession. His rival and antagonist at the bar was Coke. They were both eminent in their profession, and attained its highest honours, and most lucrative emoluments. Bacon became a Lord High Chancellor, and Coke a Chief Justice. The former had ascended the empyreal heights of literature—the latter had plunged into the learning of Norman lawyers, and had become the oracle of the common law. The works of Bacon are referred to as the oracles of truth and knowledge, and as the revelation of genuine philosophy; while the black letter learning of Coke is an Eleusinian mystery to all out of the pale of the profession. The difference between a mere lawyer great in his profession alone, and a great lawyer eminent in literature and science, can never be more forcibly illustrated than in the intellectual exhibitions of these celebrated men. Bacon enlivened, enriched, and embellished every subject upon which he wrote: even flowers sprung up under his feet in his journey through the thorny paths of legal investigation:

but from Coke you must expect nothing but the dry, barren weeds of scholastic subtlety, and Norman chicanery.

Fourthly; the energies of our country have been more directed to the accumulation of wealth than to the acquisition of knowledge. Our enterprising spirit, as exhibited in the fisheries, in navigation, and in commerce, is the admiration of the world; and if it had soared to the heavens in pursuit of knowledge, instead of creeping along the earth in the chase of riches, America would have been as illustrious in the rolls of fame as those states where literature has seen her Augustan ages. There is nothing in the commercial spirit which is hostile to literature. On the contrary, the wealth which it produces furnishes both incentives and rewards. The illustrious family of the Medici were merchants in their origin, and to them we are indebted for the resurrection of letters; but let us fervently hope that after this passion, so energetic, is satiated in its present pursuit, it may seek more sublime sources of gratification.

> To either India see the merchant fly,
> Scar'd at the spectre of pale poverty;
> See him, with pains of body, pangs of soul,
> Burn through the tropic, freeze beneath the pole!
> Wilt thou do nothing for a noble end,
> Nothing to make philosophy thy friend?
>
> POPE'S Imitation of HORACE.

Fifth and lastly; in Europe, there is a literary corps who are authors by profession. Here we have scarcely any person of this description, and we have not much vernacular literature. The consequences are obvious: while books are written beyond the Atlantic as a matter of course, they are here the offspring of some accidental direction; there the seed is, at all events, thrown into the ground, and the harvest is reaped; while here we rely upon the fortuitous produce of the chase, or the occasional supplies of the stream. This condition of things has

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inculcated upon us the vast superiority of Europe, and has made us despair of successful competition. America leans for literary support upon Europe, and we have been too much in the habit of estimating the value of books by the place of their origin. The time will surely arrive when an eminent American author shall be no longer considered an anomaly, deriving his celebrity more from the singularity, than the merit, of his productions.

Our colonial historian has, unadvisedly, stated that "the inhabitants of this colony are, in general, healthy and robust, taller, but *shorter lived*, than Europeans;"* and a French abbe,† who was attached to Count Rochambeau's army, and who published a small book of travels, visited some of our churchyards, and seeing, or fancying that he saw, on the tombstones but few notices of persons who had attained considerable longevity, has hazarded this general conclusion, that the Americans are shorter lived than the people of Europe. Censuses have been taken of this city and state, and of the United States, at various times, and with unquestionable accuracy. Bills of mortality have been kept here, and in Philadelphia, Boston, and some other towns; and tables of the number of births have also been collected in a few places. On comparing the births with the whole population, the deaths with the whole population, the number of births with the number of deaths, and considering our rapid augmentation of inhabitants, doubling in some states in thirteen or fourteen years, and upon a general average in every twenty or twenty-three years, there can be no doubt but that the United States have a decided advantage over the healthiest parts of Europe. While in Paris, London, and Amsterdam, there are more deaths than births, it is ascertained that, in our great cities, there are, at least, two births to one death. The charges which have been brought against the supposed deleterious effects of our climate upon the human body have been thus refuted with the certainty of demonstration.

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* Smith's History of the Province of New-York.

† Abbe Robin.

The imputation of an unfriendly influence upon the mind is equally groundless. Although there is, in all probability, some strong affinity between climate and genius, yet we have no reason to repine at our lot; for the peculiarities which distinguish us in this respect are not unfavourable to intellectual energy. The connexion between the mind and the body is universally admitted, and the country which administers to the beauty, the strength, and the health of the latter, cannot derogate from the vigorous faculties of the former. We have more rain, more evaporation, more sunshine, and a greater number of clear days than in Europe: our atmosphere, it is supposed, contains more electrical fluid, and we are exposed to greater extremes of heat and cold. We have no season corresponding with the European spring; but the greater part of our autumn is unparalleled for beauty, pleasantness, and salubrity. These qualities of our climate are by no means hostile to the growth of the intellect; on the contrary, most of them are highly friendly to the excitement of genius; and we cannot better express our ideas on this subject than by adopting the language of a distinguished member of this society: "If genius, industry, erudition, and the liberal arts, are begotten and nourished in a temperate climate and a pure atmosphere, America has much to expect; for the climate will ever be temperate, and the atmosphere pure, through the greater part of the continent."*

With respect to the fertility of our soil, the excellence and abundance of its products, and the luxuriant power of vegetation, there can be no dispute. Famine has never been heard of; and if facility of subsistence, salubrity and plenty of food, and all the comforts of life, can produce that composure and serenity which are generally necessary to elicit the powers of the mind, there is no country which can claim a superiority over the United States.

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* Williamson on the Climate of America, p. 177.

The nature of our government, and the constitution of our confederacy, are admirably adapted to promote the interests of science. Free governments are the native soil of great talents. "Though a republic should be barbarous," says Hume, "it necessarily, by an infallible operation, gives rise to law, even before mankind have made any considerable advances in the other sciences; from law arises security; from security curiosity, and from curiosity knowledge."* That most profound political writer whom I have just quoted, with the vast volume of history before his eyes, and aided by all the powers of an analyzing and investigating mind, has laid down the following incontrovertible propositions in relation to the influence of government upon the arts and sciences.

1. It is impossible for the arts and sciences to arise, at first, among any people, unless that people enjoy the blessing of a free government.

2. Nothing is more favourable to the rise of politeness and learning than a number of neighbouring and independent states connected together by commerce and policy.

3. Though the only proper nursery of these valuable plants be a free government, yet may they be transplanted into any government; and a republic is most favourable to the growth of the sciences, a civilized monarchy to that of the polite arts.†

Although this was published more than half a century ago, yet it suits our situation so precisely that one would suppose the writer had the United States fully in his view. Perhaps the flourishing condition of the literature of Europe is, in a great degree, owing to the division of that continent into a number of independent states. Each capital is a place where letters are encouraged, and the different governments vie with each other in rewarding the effusions of genius; but if Charles V., Lewis XIV., or Napoleon, had succeeded in establishing an universal monarchy, the dark ages of Gothic barbarity would have revisited mankind. Thus, under the direction of an all wise and beneficent God, the half-civilized serf of Russia has become the unconscious guardian and protector of knowledge. The small country of Attica, not so large as Long Island, can never be contemplated without the mingled emotions of veneration and sorrow. "Ab Athenis enim humanitas, doctrina, religio, fruges, jura, leges, ortæ, atque in omnes terras distributa, putantur." "It is acknowledged," said Cicero, "that literature, polite arts, religion, agriculture, laws, and social rights, originated in Athens, and were thence distributed over all nations." The fertility of the soil, the excellence of the climate, the freedom of the government, and the enterprising spirit of the people, must have coöperated in producing this transcendent and preëminent state of human exaltation. And if a comparison was instituted in those respects between that country and ours, in what important part would we be deficient?

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* Hume's Essays, vol. 1. 14th Essay.

† Ibid.

We are, perhaps, more favoured in another point of view. Attica was peopled from Egypt; but we can boast of our descent from a superior stock. I speak not of families or dynasties; I refer to our origin from those nations where civilization, knowledge, and refinement have erected their empire, and where human nature has attained its greatest perfection. Annihilate Holland, Great Britain, Ireland, France, and Germany, and what would become of civilized man? This country, young as it is, would be the great Atlas remaining to support the dignity of the world: and perhaps our mingled descent from various nations may have a benign influence upon genius. We perceive the improving effects of an analogous state upon vegetables and inferior animals. The extraordinary characters which the United States have produced may be, in some measure, ascribed to the mixed blood of so many nations flowing in our veins; and it may be confidently predicted, that the operation of causes, acting with irresistible effect, will carry, in this country, all the improvable faculties of human nature to the highest state of perfection.

Taking it for granted that the United States afford every reasonable facility and inducement for the cultivation of letters, it cannot be doubted but that this city is the proper site for a great literary and scientific institution. When we view the magnitude of its population, the extent of its commerce, the number of its manufactures, and the greatness of its opulence; when we contemplate its position near the Atlantic, its numerous channels of communication by land and by water with every part of the United States, and the constant and easy intercourse it can maintain with all parts of the civilized world; when we consider the vast fund of talent, information, enterprise, and industry which it contains; and when we take a prospective view of the rank which it is destined to occupy as the greatest commercial emporium in the world, we must acknowledge that no position could be selected better adapted for acquiring information, concentrating knowledge, improving literature, and extending science: and we may say of this place as Sprat, in his History of the Royal Society, said of London: "It has a large intercourse with all the earth; it is, as the poets describe their house of fame, a city where all the noises and business in the world do meet, and therefore this honour is justly due to it, to be the constant place of residence for that knowledge which is to be made up of the reports and intelligence of all countries."*

The Royal Society of London, for the improving of natural knowledge, (the first institution of this kind,) was established about the year 1663. Butler, the author of Hudibras, wrote a satire against it, entitled "The Elephant in the Moon." Sprat, the historian of the society, feeling too acutely the shafts of ridicule, attempted, in a singular way, to propitiate the hostile wits. "To gain their good will," said he, "I must acquaint them that the family of Railleurs is said to be derived from the same original with the philosophers. The founder of philosophy is confessed by all to be Socrates, and he also was the famous author of all irony. They ought, therefore, to be tender in this matter, wherein the honour of their common parent is concerned."† Cowley, on the other hand, wrote a complimentary address to the society.

The satire of Butler has sunk into oblivion, while the society which it assailed has established a reputation and usefulness that cannot be subverted or denied. From its origin to the end of the eighteenth century (as appears from Dr. Thompson's History of the Royal Society from its institution to the end of the eighteenth century) it has published 4,166 memoirs on natural history, anatomy, surgery, medicine, mathematics, mechanical philosophy, chemistry, and miscellaneous subjects, the greatest number of which is on astronomy, medicine, and chemistry. The institution of this society was soon followed by that of the Royal Academy of Sciences at Paris, and similar associations have been since formed in almost all the important cities of Europe.

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* Sprat's History of the Royal Society.

† Ibid.

The first society of the kind in this country was the American Philosophical Society, held at Philadelphia, for promoting useful knowledge, which was founded in 1769; its principal promoter was Dr. Franklin:* it has published six volumes of transactions. The American Academy of Arts and Sciences was incorporated in Massachusetts in 1780; and the Connecticut Academy of Arts and Sciences was established in 1799. All these institutions have given to the world several useful and interesting memoirs. The United States Military Philosophical Society was founded at West Point, in this state, in 1802, by Colonel Williams, Chief of the Corps of Engineers, and Military Academy. The whole corps of engineers were the original members, and its number has been increased by the admission of others from different parts of the United States. This attempt to diffuse science has been attended with remarkable success, and was worthy of the gentleman who inherits the investigating mind as well as the blood of Dr. Franklin. The Travels and Discoveries of Pike, the History of Louisiana by Stoddard, the Code of Martial Law by Macomb, a Treatise on the Organization of Artillery by Morton, several important military memoirs by the president of that institution, and the system of maritime defence adopted, and now visible in our harbour, may be considered as emanations from it.

Such associations are productive of great individual and collective benefit: they stimulate the mind to exertion, produce emulation, and form habits of observing with accuracy, and of reading with attention; they elicit powers that would otherwise lie dormant, and collect knowledge that would otherwise be scattered. "Science, like fire, is put in motion by collision."† The communion of cultivated minds must always have a benign influence on knowledge; and the experience of a century and a half bears testimony to this truth.

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* See Note F. † Transactions of the Literary and Philosophical Society of Manchester.

The objects of The Literary and Philosophical Society of New-York being coextensive with the principal branches of human knowledge, an unbounded prospect of investigation lies before us. It would be an Herculean task, far transcending my powers, and occupying too much time, to point out those desiderata in science which ought to be supplied, and to indicate those improvements and refinements which ought to be engrafted into our literature; but it may not be unimportant, with respectful deference, and in a very concise manner, to invite your attention to those objects of inquiry which refer to the peculiar situation of this country, which have been little attended to, or entirely neglected, and which, on account of their peculiar importance, deserve and demand our notice.

In the first place, the geology of our country is almost unknown, and few attempts have been made to elucidate it. William Maclure has, indeed, applied the Wernerian system to the United States, has undertaken to divide the country into regions of primitive transition, flætz, and alluvial rocks, and has, upon this plan, delineated those different formations in a geological map of the United States. He has not noticed any volcanic formations, probably from an opinion that none exist.

Dr. Mitchill, in a report made to the Agricultural Society, has divided the state into

The granite country,
The schistic,
The lime stone,
The sand stone, and
The alluvial;

and has designated the different regions in which those divisions exist.

Volney, borrowing the ideas of Mitchill without acknowledging the obligation, has applied this theory to the United States at large; and his geological division consists of

The granite region,
The region of sand stone,
The calcarious region,
The region of sea sand, and
The region of river alluvions.

He has, in one instance, departed from Dr. Mitchill's arrangement by substituting a region of sea sand for a schistic region.*

These are the principal attempts which have been made to illustrate our geology, and although entitled to merit, they are imperfect, and, probably, to a considerable extent fanciful. Amid the thirty-eight different substances which Maclure has mentioned as composing the different formations, the others have designated but five; and although I presume that the denomination given to a particular region is only intended to indicate that the principal rocks or substances are of the kind from which the appellation is derived, yet it must be obvious, that in such an extent of country it is utterly impossible to arrive at such a conclusion without the most minute and scrutinizing surveys. It is difficult to distinguish and ascertain the different kinds of formations; it requires considerable practical knowledge to discriminate between matter purely inorganic, and its mixture with organic substances; and as strata of different as well as of cognate species are not only piled upon each other, but are frequently buried in the bowels of the earth, there is great difficulty in forming just conclusions. This science, and the kindred science of mineralogy, have been almost entirely uncultivated with us; and when we consider their immense importance, and the extensive investigation which they open, we must be convinced that we ought to devote more than ordinary attention to their cultivation.

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* See the Transactions of the American Philosophical Society, vol. 6.—Transactions of the Society of Arts held at Albany, vol. 1.; and Volney's View of the United States.

The aspect or physiognomy of our country is certainly marked by striking and extraordinary characters. The Hudson is the only river in the United States where the tide passes through the alluvial primitive transition and into the flætz formation. In the east we have an ocean of salt water. In the west we have fresh-water seas of immense extent: there is every indication, not only of the recession of lakes, but also of their total exsiccation:* hence we have three kinds of alluvial formations: one arising from the retreat of the ocean, another from the subsidence or extinction of lakes, and another from the overflowing, retreat, and change of rivers. Marine and vegetable substances are to be found, particularly in the western parts of the state, embedded in sand-stone, or in silicious or calcarious stone; and, besides evidently recognising in them aquatic animals which are well known to us, we perceive a great number of unknown ones, that must be pelasgian or oceanic, and which must have derived their location from the general submersion of the earth. The cornu ammonis has been found near Albany, about which there is a diversity of opinion; some supposing that it is the horn or bone of some animal, while others consider it a native fossil.† All these indications support the Neptunian theory; but there are several circumstances which denote the agency of an igneous principle. Volney, indeed, supposes that Lake Ontario occupies the crater of a volcano; and it is believed

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Πεληγος - Sea

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* See Note G.

† See Note H.

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that the drowned lands in Orange county exhibit, in many places, strong evidences of volcanic eruptions.

Our principal metals are iron and lead; of inflammable fossils we have made no discoveries of any consequence, although there is, no doubt, plenty of coal. Lime, marble, marl, flint, gypsum, slate for building, clays for manufacturing, and ochres of various kinds, have been discovered in great quantities. Salt springs exist in Onondaga, Cayuga, Seneca, Ontario, and Genesee counties; and there is reason to believe that vast strata of fossil salt, commencing at Onondaga, as the most easterly point, run west through this state, the back parts of Pennsylvania and Virginia, and the states of Ohio, Kentucky, and Tennessee, pass under the bed of the Mississippi river, and finally may be traced in the remotest wilds of Louisiana. A bed of gypsum begins in the town of Sullivan, in Madison county, and branches in a western direction; it is very wide, and its depth has not been ascertained: it appears in several places in the towns of Sempronius, Manlius, and Camillus; but its main body seems to pass through Aurelius, and near the outlets of the Cayuga and Seneca Lakes, and Phelps Town in Ontario county, and finally it is visible at Grand River in Upper Canada.* The value of these saline and earthy substances is incalculable: several millions of bushels of salt can be easily made in this state, and three millions are imported in ordinary times. Gypsum formerly came to us in small quantities from France, and our supplies have been derived, for a long time, from Nova Scotia. It has created a new æra in agriculture: under its influence the wilderness and the solitary place become glad, and the desert rejoices and blossoms as the rose. We have not only a sufficient quantity for our own use, but we now accommodate Pennsylvania with from ten thousand to fifteen thousand tons of this invaluable manure. The state would have been in a truly enviable situation, if correspondent discoveries of coal mines had been made; and the recent refusal of the legislature to promote this important object is seriously to be regretted.

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* See Note I.

The medicinal and mineral springs with which this state abounds are deserving of further investigation. The springs in Saratoga county are unrivalled for salubrity; others exist in different places, which have beneficial effects upon health. There are sulphur springs in Otsego, Cayuga, and Ontario counties; and it remains yet to be determined whether great quantities of sulphur may not be obtained from them. There is a bituminous spring in Alleghany county, whence the famous Seneka oil is obtained. In Purchas' Pilgrims it is stated, that "near unto Buchan in Persia is a very strange and wonderful fountain under ground, out of which there springeth and issueth a marvellous quantity of black oil which serveth all parts of Persia to burn in their houses."* It is also used in that country for lighting streets, and in its purest forms is called naptha. At Amiano, in Italy, the petroleum of a spring, discovered within a few years, is also employed to light their cities. It might be of considerable consequence to discover whether the petroleum of our springs might not be used for like beneficial purposes.†

"Homo naturæ minister et interpres." Man is the minister and interpreter of nature, said a great philosopher;‡ and he ought unquestionably to commence the study of the important science of nature by becoming acquainted with his own species in every form of existence, and in every stage of society from the erratic savage of the forest to the polished inhabitant of the city. In this country we behold man in every shape and modification of insulated and social being. When we peruse Herodotus' description of the Scythians, Thucydides' of the ancient Grecians, Cæsar's of the Gauls and Britons, and Tacitus' of the Germans, we perceive the prototypes of our Indians; but we have it in our power to view man in a savage state with our own eyes, without relying upon the reports of others; and it is to be regretted that so much time has transpired without more attention being bestowed on this interesting subject. Dr. Robertson says, "almost two centuries elapsed after the discovery of America before the manners of its inhabitants attracted, in any considerable degree, the attention of philosophers." This neglect can, perhaps, never be fully retrieved. An intercourse with civilized man has changed our Indians in almost every respect; but there is still a sufficient remnant of their manners, languages, and traditions left to interest inquiry, and invite investigation: in some very remote quarters they may still be found in the unsophisticated forms of original barbarism, unaltered by extrinsic intercourse. Many of their languages may still be redeemed from oblivion, their persons may be delineated, and their manners and traditions may be described; and the knowledge which may be obtained, added to what has already been collected, may furnish invaluable illustrations of the human species.* The number of languages in Mexico is thirty-five, of which fourteen have grammars and dictionaries. The Bible has been translated by Eliot, the Indian apostle, into the Algonquin language:† two thousand copies of the Mohawk version of St. John's gospel have been lately printed by the British and Foreign Bible Society; and we have many and considerable collections of words in different Indian languages. Our antiquities are of two kinds, such as relate to the aboriginal, and colonial states. We have no Indian monuments or curiosities that can be compared with the forts on the Ohio, or with the temples of the Aztecs. There are some remains of Indian pottery, of weapons, and of rude paintings. Mounds of earth, like the tumuli, in Scandinavia, Russia, and Tartary, the barrows in England, and the cairns in Scotland and Ireland, may still be seen, and also the outlines of extensive fortifications. But the variegated condition of the white man here exhibits human nature in all its shapes: we behold him in every stage of society from the semi-savage hunter to a polished citizen; and we perceive every stage of cultivation from the first tree that was cut to the elegant habitation. "In North America," says a distinguished writer, "a traveller who sets out from a great town, where the social state has attained to perfection, traverses successively all degrees of civilization and industry, which keep diminishing till he arrives in a few days at the rude and unseemly hut formed of the trunks of trees newly cut down. Such a journey is a sort of practical analysis of the origin of nations and states. We set out from the most complicated union to arrive at the most simple elements. We travel in retrogression the history of the progress of the human mind, and we find in space what is due only to the succession of time."*

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* Purchas' Pilgrims, vol. 2. p. 1431. † See Note K. ‡ Bacon's Novum Organum.

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* See Note L.

† Clavigero's Mexico, vol. 2.

Zoölogy has been greatly neglected. Linnæus has distributed animals into six classes, and has arranged the mammalia (consisting of viviparous animals which suckle their offspring) into seven orders, according to the position and peculiarity of their teeth.* This arrangement, which places man in the same order with apes, monkeys, and bats, has been rejected by eminent zoölogists. Some have distinguished animals by the hoofs and toes, and others by the structure of the heart. The want of a regular and established system has created confusion in this science, and has added to the difficulties of those Europeans who have attempted to describe our animals. There has not been written, in this country, any professed work on its quadrupeds, and those sketches which have been published are greatly deficient, especially in omitting to notice at large the habitudes and manners of animals, the most interesting part of natural history. A writer, devoting himself to the elucidation of our quadrupeds alone, and confining his view to this state, would have subjects of vast interest and moment. He would undoubtedly place, at the head of his list, the mammoth, or elephas Americanus, skeletons of which have been discovered in Orange and Ulster counties, and one has been put up in Peale's Museum. He would elicit all the information that could be obtained from this source; he would examine the different hypotheses which have been suggested in relation to this animal, and he would not even overlook the traditions of the Indians; he would determine whether it was herbivorous, or carnivorous; whether it was the hippopotamus, the rhinoceros, the common elephant, a monster of the ocean, or a distinct race of animals; and he would avail himself of the knowledge which is to be derived from the Russian discoveries.†

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* Talleyrand on Colonization.

He would then describe the white brown or grizzly bear, the ferocious tyrant of the American woods, and would show that it is a nondescript, and a distinct animal from the ursus arctos, or polar bear, with which it is confounded. He would state the effects that the settlement of the whites, and particularly the terror which accompanies the gun, have had upon wild animals, driving them into the boundless regions of the northwest, and over the waters of the Mississippi; that the grizzly bear formerly resided in this state, according to the traditions of the Delaware and Mohican Indians, who say that the last was seen on the east side of Hudson's river, and they to this day terrify their children with it; that the claw of the unknown animal which was discovered in a cave in Virginia, and which Mr. Jefferson calls the *Megalonyx,* was probably the claw of this animal, who has retreated from the eastern parts of the continent, and occupies that wide and extensive range of country upon all the waters which form the sources of the Missouri, where he exists the terror of the savages, and the tyrant of all other animals, devouring alike man and beast, and defying the attacks of whole tribes of Indians.*

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* See Note M.

† See Note N.

These descriptions might be increased in interest by referring to the time when the buffalo, which now occupies the prairies of Louisiana, in herds sometimes of fifty thousand, inhabited this state. This animal is supposed, by Pennant, to be the bonasus, urus, or bison, of the ancients, and the stock from whence our domestic cattle is derived, although Buffon is of a different opinion. He must be carefully distinguished from the bos Indicus, or buffalo of India, which is a distinct race, and is in a domestic state in Italy and some other parts of Europe. The American buffalo has also been tamed, in a few instances; and both these animals may be rendered highly useful in husbandry.† The moose and the elk have been confounded together by European naturalists, whereas they are radically distinct.* The former is confined to America, is never seen south of the forty-fourth degree of north latitude, and his range is limited to about ten degrees of latitude, and fewer of longitude: he may probably grow to the height of twenty hands. There is reason to apprehend the total extinction of these animals, as they herd in droves of eighteen or twenty in winter, and return to the same spot at night, and, when the snow is deep and encrusted, suffer themselves to be killed without moving from the place they have trampled. It is now time, therefore, to have an accurate account of this animal, which may still be found in the northern parts of the state; and the idea was so forcibly impressed upon the mind of a learned emigrant,† that, in an address to an Agricultural Society in Whitestown, in 1795, he proposed premiums for certain dissertations, and among others, "for the best anatomical and historical account of the moose, fifty dollars, or for bringing one in alive, sixty dollars." The moose, as well as the elk, may be reclaimed from its wild state. The latter is not so tall as the former, and, perhaps, never exceeds fifteen hands; and he generally inhabits milder climates. The reindeer has, also, in former times, in all probability, extended his travels to this state from the regions of the north; his favourite food, the lichen rangiferinus, is to be found in our mountains. Our tiger, or panther, the felis concolor of Schreber, and the couguar of Buffon, is the same animal called the puma or lion of South America, where he is extremely ferocious; the mildness of our climate having rendered him a less dangerous animal. The beaver, in his state of habitation, may still be found in the remote parts of the state. The names of many creeks, rivers, and places, denote the former residence of animals which have long since abandoned them; but it would engross too much time to pursue these hints. I cannot, however, close them without remarking that this branch of zoölogy affords abundant room for original inquiry and description.

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* See Note O.

† See Note P.

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* See Note Q.

† F. Adrian Vanderkemp.

Many meritorious attempts have been made to illustrate the ornithology of America. Mr. Alexander Wilson, whose death is to be sincerely lamented by every friend of science, had devoted himself for years to this subject, with an enthusiasm, industry, and ability never surpassed. The exactness of his likenesses, the fidelity of his descriptions, his interesting representations of the manners of birds, and the talents for observation and delineation which are displayed in every part of his elaborate work, justly place it in the first rank of writings on natural history. Although he has done so much, yet the subject is by no means exhausted.* There are doubts on many points, which one would think ought long since to have been settled.† But the most interesting part of ornithology is the migration of birds. There are some that stay with us the whole year; there are others that visit us regularly: and there are several that visit us occasionally or accidentally, which are driven by storms on our coast, by famine from their usual country, by excessive heat from the south, or excessive cold from the north, or by some cause unknown to us. All these birds ought to be carefully noted, and accurately distinguished. Strange birds are frequently seen in the vicinity of the ocean after a storm. Several years ago a large flock of paroquets was observed twenty-five miles to the northwest of Albany. I am credibly informed that the last ravages of the canker worm on the west side of Long Island, were arrested by a strange bird

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* See Note R.

† See Note S.

(called by the farmers the canker worm bird) never seen before nor since, and which devoured that destructive vermin with great voracity. There are birds that sometimes stay with us the whole year, and at other times depart: this depends upon the mildness of the weather, and the quantity of food. With the ancients, husbandry was regulated by the appearance of particular birds, and calendars of Flora have been kept in different parts of Europe, embracing this and other objects which are calculated to be highly useful. I do not know that any calendar of this kind has been made in this state; but any person possessed of any talent for observation might easily compile one, which, in order to be complete, ought to contain an account of the leafing and flowering of plants and trees, the progress of vegetation, the departure and return of birds, and correct meteorological observations.

When on this subject it may not be amiss to draw your attention to a very striking difference between the country east and west of the Alleghany Mountains in this state, which is to be observed very distinctly in relation to birds, plants, and quadrupeds, and which formerly applied to the Aborigines. At the first settlement by Europeans, the Indian population was greater on the west than on the east side of the mountains. I have seen that beautiful bird the loxia cardinalis in our western country, and I believe it never appears here: there are other birds that follow the cultivation of the country from the east: this is the case with the crow;* in some of the western parts of our country he is not to be observed; the raven supplies his place; and it is conjectured that several of the migrating birds come up on our side of the mountains and return on the west. There are several trees and plants in that part of the state which do not grow in this. There seem to be two races of squirrels: in the west they are black, in the east they are gray; and while many wild animals have left us, the great hare of the north is extending his excursions in a southern direction.[*]

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* See Note T.

On the approach of cold weather the birds, as if actuated by an intelligent principle, prepare for their departure. Some of them retire in the night, or ascend so high that their flight is not observed; while others appear in full view, and attract not only the notice of the naturalist, but become the subject of poetical description.

Milton thus speaks of the migration of cranes:

"Part loosely wing the region, part more wise
In common, rang'd in figure wedge their way,
Intelligent of seasons, and set forth
Their airy caravan, high over seas
Flying and over lands, with mutual wing
Easing their flight: so steers the prudent crane
Her annual voyage, borne on winds; the air
Floats as they pass, fann'd with unnumber'd plumes."
PARADISE LOST.

And Tasso, in like manner, says,

"With such a sound the cranes embodied fly
From Thracian shores to seek a warmer sky,
With noise they cut the clouds, and leave behind
The wintry tempest and the freezing wind."
TASSO, v. 2. b. 20.[†]

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[*] See Note U.

[†] See Note V.

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The secret departure of many species of birds has introduced much fable into ornithology. It is time that the submersion of swallows, and the fascination of serpents, should be banished from our natural, and the Welch nations of Indians from our civil, history. In the midst of winter, when occasional mild weather occurs, birds that were supposed to have left the country, suddenly reappear. This has induced a belief that many of them remain in a torpid state during the winter, in the fissures of rocks, or in hollow trees; all these indications ought to be carefully watched. Buffon says, that of three hundred species of quadrupeds, and one thousand five hundred of birds, man has selected but nineteen or twenty, and that only nine species of birds have been domesticated. He is greatly mistaken in the number of species, although he is nearly right in other respects.* The list of useful domestic birds may be greatly increased. The Canada goose and the turkey, it is believed, have been added by America: the black duck, brant, wood duck, and prairie hen, have, in many instances, been tamed, and why might not teal and grouse be also domesticated? Our stock of domestic fowl might also be increased by the Peruvian hen and the hoco or curasso of South America, which is about the size of a turkey; the flesh of both is much esteemed; and why might not our useful wild birds be augmented by importing from Europe the red-legged partridge, and the pheasant: it is supposed that pheasants were brought into Europe by the Argonauts, one thousand two hundred and fifty years before the christian æra, from the banks of the Phasis, a river in Colchis in Asia Minor.†

Our ichthyology has received little attention. Dr. Mitchill, to whom science is greatly indebted, has recently published a small work on the fishes of New-York, and it is to be hoped that he will continue his useful labours.[*] The migration of fishes is as curious an object of inquiry as that of birds. The anadromous fish affords, particularly, great scope for observation. Is it true that while the herrings ascend on one side of the Hudson above Albany, that the shad proceed on the other?[†] Our great lakes, and the streams which run into them, present a wide field for remark: it is worthy of notice that there are in the lakes fishes corresponding in appearance with those in the sea: the sheep's head, the sturgeon, and the bass, may be mentioned as instances. It has been judged very difficult to discover how sturgeon get into Lake Erie, on account of the Falls of Niagara; and it is said that a French governor had some conveyed into it from Lake Ontario; but it is very easy to account for it in another way: the Illinois river frequently communicates, in spring and autumn, with the Chicago creek, which discharges itself into Lake Michigan.[‡]

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* See Note W.

† See Note X.

The production and migration of eels have puzzled naturalists. The laws which govern this fish are peculiar: the eel goes to the sea for production, and the young ones attain their growth and maturity in fresh water.

The milldams and other artificial obstacles in rivers against the ascent of anadromous fishes have, in some places, entirely expelled them, and in others diminished their number. The salmon, if we may credit the account of Hudson's voyage, formerly visited this river: he is now an entire stranger, and he is retiring very rapidly from the Connecticut river, and from several streams that flow into the western lakes.[§] The disappearance of fish for years, as for instance the lobster, during the revolutionary war, and sometimes the visits of strange fish, are circumstances deserving of observation. The best mode of multiplying and preserving shell fish would be a subject useful to investigate, and why might we not increase our fresh water fish by importing the carp and tench for propagation, as was formerly done in Great Britain?*

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[*] See Note Y. [†] See Note Z. [‡] See Note AA. [§] See Note BB.

The Linnæan classes of amphibia, vermes, and insects, have been almost entirely overlooked; and yet what an immense field for inquiry do they present? There are, it is estimated, twenty thousand species of insects: twenty species feed on the apple tree alone, seventeen of which are phalænas (millers.) There are seventy-five species of the aphis, (plant louse,) so destructive to vegetation. The ravages of the weavil, hessian fly, canker worm, palmer worm, grass worm, and rose bug, are incalculably injurious. Dr. Barton has intimated that several of our animals supposed to be indigenous may be of European origin.† Be this as it may, we know that noxious insects of native origin, migrate from native to naturalized vegetables, as they furnish more abundant or agreeable food. Different preventives and remedies have been prescribed for their depredations, but it still remains to discover effectual ones. Silk worms are cultivated with great success in some parts of the country, and excellent silk is made. It has been disputed whether the apis mellifica, or honey bee, has not been imported into America? Jefferson and Barton say it has; Belknap has taken opposite ground. One would suppose that Cortez had settled this question in his letters to the Emperor Charles V., which describe all the commodities vended in the great market of Mexico, where, he says, "There is sold honey of bees and wax: honey from the stalks of maize which are as sweet as sugar, and honey from a shrub called by the people maguey." Lewis and Clarke, in their journey to the Pacific Ocean, did not observe the honey bee after they left the Osage Indians.*

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* See Note CC.

† See Note DD.

Our ophiology is, of course, of a very limited range. We have between thirty and forty species of serpents; the most remarkable one, the rattlesnake, crotalus horridus, not being able to exist in the vicinity of swine, has fled from the cultivated country. Is it true, that on apprehension of danger, the young retreat into the mouth of the mother for safety?†

But it is time to stop these intimations, already too desultory and minute; and we shall make a few general observations which are intimately connected with the flourishing condition of natural knowledge.

1. The establishment and encouragement of cabinets of natural history are essential to the promotion of this interesting science. Scudder's Museum in this city, and Peale's in Philadelphia, are invaluable institutions, deserving private and public patronage.

2. Statistical inquiries ought to be prepared and circulated in every town, eliciting information on every subject connected with the natural history, geography, agriculture, commerce, and manufactures of the state. An excellent specimen of statistical questions may be seen in the Transactions of the Academy of Arts and Sciences of Connecticut. Dr. Dwight's account of New Haven is a model for writers on this interesting branch of knowledge to imitate.

3. Inquiries ought to be prepared and transmitted to different parts of the world, with a view of obtaining intelligence on all important subjects relative to science and literature. Specimens of this mode of accumulating useful facts may be found in the Transactions of the Royal Society of London: that learned body adopted this plan at their first

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* See Note EE.

† See Note FF.

establishment. Our Agricultural Society in 1793, proposed to the chamber of commerce that standing instructions should be given by the merchants to the captains of vessels sailing to Africa, Asia, and the north of Europe, and the southern and western parts of America, to collect information respecting husbandry; and the chamber of commerce recommended the measure; but it is believed that no beneficial result has accrued.

4. Men of observation and science ought to be employed to explore our country with a view to its geology, mineralogy, botany, zoölogy, and agriculture. They ought not only to examine with their own eyes, but to avail themselves of local information, to be derived from intelligent men in every part of the state. By these means a mass of valuable and authentic information may be obtained which can, in most cases, be acquired in no other way.

The celebrated Linnæus often expressed a wish to visit America, in order to explore its vegetable productions. His disciple Kalm, travelled through this country in 1748, for that purpose. Since the revolutionary war several European princes have sent scientific men here to make collections and observations on our natural history. The Michaux, father and son, have thrown great light upon our botany by their inestimable labours. The elder of them published a treatise on the Oaks of America, wherein he describes twenty-nine species and varieties: the younger, who, with much ability, edited and published, in 1803, the Flora Boreali Americana, chiefly the result of his father's investigations, has also lately completed, at Paris, the Histoire des Arbres Forestiers de L'Amerique Septentrionale, in three volumes. In this work F. André Michaux has considered our forest trees more particularly as subservient to commerce and the arts. The respective performances of these distinguished and enterprising botanists, may justly be considered as among the most important contributions which the natural history of North America has received. The Botanical Garden, established in the vicinty of this city by Dr. Hosack, contains seven hundred and thirty-three genera, and two thousand four hundred species of plants: it was purchased by the state in 1810, and recently presented to Columbia College: it is to be hoped that this valuable institution will prosper under its new proprietors, and that a professorship of botany will be connected with it. Dr. Muhlenburg of Lancaster, an eminent botanist, has lately published an account of the native and naturalized plants of America according to the Linnæan system, which includes eight hundred and sixty-three genera, and their corresponding species.

It has already become difficult to discriminate between our native and naturalized plants; with the progress of time the difficulty will increase, and it ought to be removed as soon as possible. From the vegetable kingdom man derives his principal food and medicine, and it administers to his wants and luxury in a variety of shapes. The botanist ought to attend to the substitution of indigenous medicines of equal efficacy to those imported, and also to the discovery of others whose qualities are now unknown, as applicable to the cure of diseases: he ought also to direct his attention to the discovery of indigenous esculents, and of articles for dying, soap, lights, and other branches of domestic economy. America has furnished maize, or Indian corn, which may be compared with the best of the cereal gramina of the old world; she has also originated the potato, which has administered more to human subsistence than any other production whatever. There are probably other undiscovered legumens and gramina which may essentially contribute to the comfort and support of mankind. It is said that there is a natural meadow of vast extent in the Michigan territory, which abounds with wild potatoes and artichokes; it would certainly be worth while to ascertain whether they are the real solanum tuberosum, and helianthus tuberosus.* All the Indians of the northwest have, according to Pike, a species of wild oats for their only farinaceous food: we would rather suppose it to be a species of rice, as it is an aquatic plant; and if each stalk produces, as it is stated, half a pint of grain, it is undoubtedly an object deserving of attention.† Lewis and Clarke have pointed out several vegetables unknown to us, which the Indians use. These and many other sources of inquiry are open to us. The discovery of a new plant gives celebrity to a botanist, and, if useful to mankind, his fame is immeasurably enlarged. Before I conclude this subject permit me to inquire whether the cypripedium bulbosum has ever been seen in this country? I ask this question, because Acerbi, in his Travels, has made the following observations respecting it:

"To Mr. Custrien science is indebted for the discovery of a famous plant, viz. cypripedium bulbosum, which was first seen by Rudbeck in 1685, but had never been found since by any botanist, not even by the great Linnæus, who passed this way in July, and, consequently, a month after it had been in flower. This plant skulks among the underwoods and firs which surround the church of Kemi. It modestly eludes the prying eyes of the passenger, and loves the temperate enjoyment of the sun's rays, which can only reach it by insinuating themselves between the branches of the bushes that overshade it. Dr. Smith, President of the Linnæan Society, has given us a coloured figure of it extremely accurate and lively, which the reader may see and admire in his collection of rare plants. This is one of the rarest as well as most beautiful productions of the north: it is indigenous in the Parish of Kemi.

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* See Note GG.

† See Note HH.

Hitherto it has been discovered nowhere else except, as I have been informed, in North America."*

Adequate and satisfactory notices of our hubandry would occupy too much time. Our attention ought to be drawn to supplies of the best and most powerful manures. As gypsum has no influence in the atmosphere of the sea, it is a great desideratum to find a substitute equally efficient for the Atlantic parts of the state. Fish, peat, sea weed, street dirt, calcined pyrites, lime, ashes, and marl, have been all recommended, and some of them have been tried with great success. The dyking of salt meadows and marshes, and thereby creating excellent land for tillage and grass, and the irrigation of lands, would be very advantageous, and they have not been practised with us except in a few solitary cases. Several plans for a rotation of crops have been proposed, but have not been attended to in a manner due to their importance. The failure of wood not only requires some beneficial system for replenishing our forests, but for accommodating the farmer with substantial fences: hedges of white thorn or hawthorn may answer a valuable purpose, and it is believed that there are three species with us, two native and one imported from Great Britain. Of all the culmiferous plants, wheat contains the heaviest grain, and it is certainly the most important of the cerealia: it is our great staple commodity, and the utmost care ought to be taken in perfecting and protecting it against the injuries which it receives from various sources. The selection of the best kind for seed is a great object, there being several species, red, white, yellow, bald, bearded, summer, and winter. It is obnoxious to injury from cockle, drips, sorrel, commixture of rye, smut, the weavil, the hessian fly, blast, and mildew. The cause of mildew is unknown; the blast sometimes arises from the effluvia of barbary bushes, but generally from the rapid growth of the grain in June. The origin of the hessian fly, and the best remedy against its depredations, are subjects about which there is a contrariety of opinion.* Particular attention ought also to be devoted to the selection of the best grasses. Lucern, sainfoin, esparcet, and pimpernel, foreign and perennial grasses, have been mentioned as highly useful. Red clover and timothy are also exotics; but white clover is a native plant, and invariably follows cultivation. The avena elatior, or tall meadow oats, was imported some years ago into Pennsylvania by Dr. Muhlenburg, and is recommended as the best grass for green fodder and hay. The festuca ovina, or sheep's fescue, is preferred in Sweden to all others for sheep. Gmelin says that the Tartars fix their tents during the summer in those places where there is the greatest plenty of this grass, and that the sepulchral monuments of the ancient Tartars are mostly found where it abounds, which shows that it has been long valued by them. Stillingfleet says that it is found in abundance in many parts of England and Wales. In the Hortus Elginensis, published by a distinguished botanist,† it is mentioned as being in that establishment, and as a hardy perennial plant: it is a vernal grass, and not a native of this country: I have mentioned it thus particularly because it is so important a nutriment to sheep, of which it is believed we have nearly two millions in this state. Wonderful qualities are ascribed to the Guinea grass in Jamaica, and the fiorin‡ is highly commended as surpassing all the grasses in its nutritious powers.§ In selecting the best foreign grasses for cultivation we ought not to be unmindful of those which nature has provided us at home. In the western parts of this state there are several native grasses deserving of attention.

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* Acerbi's Travels through Sweden, &c. vol. 1. p. 340.

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* See Note I I. † Dr. Hosack. ‡ Agrostis Stolonifera. § See Note KK.

One kind called the winter grass resists the effects of frost, and when the snow leaves the ground in the spring, furnishes nourishing pasture. Another species is stated to resist a dry season, and to be in full verdure when all other plants are perishing with drought. A perennial plant called the wild pea is said to be superior to clover as fodder, to which it is not only preferred as nourishment, but it has this advantage, that the stock is not so brittle, nor are the leaves so apt to pulverize. There is a highly aromatic plant collected by the Indians in small quantities, called the Seneca grass.* When on this subject it is proper to state, that there are certain plants which are pernicious to some kinds of cattle and not to others; for instance, the meadow-sweet† wastes away the cow, but is beneficial to the goat: the long-leaved water hemlock will destroy a cow, whereas the goat browses on it greedily; monk's hood kills the goat, but will not hurt a horse; the andromeda, or dwarf laurel, is very fatal to sheep, and so is the kalmia latifolia, which is devoured with avidity by deer.

Greater attention ought to be paid to the cultivation of our fruit, and to the destruction of those noxious insects and worms which have, within a few years, injured it beyond measure. Our soil and climate are admirably adapted for some of the most delicious fruits. The Spitzenbergh apple is said to have been discovered accidentally in the vicinity of Albany, and it is only rivalled by the Newtown pippin, whose excellence is also, probably, of local origin, and which reminds us of the malum aureum of the ancients. We ought, also, to be particularly attentive to the introduction and naturalization of the best foreign fruits, and the importance of this will be duly appreciated when we consider the origin of those which are now most esteemed. The cherry and filbert are from Pontus; the apricot from Epire; the peach from Persia; the citron from Media; the pomegranate from Carthage; the quince from Cathonea; the plumb from Damascus; the best pears from Alexandria; and the olive and fig from Greece.*

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* Holcus Fragrans—See Note LL.

† Spiræa Ulmaria.

It would certainly not become me to point out the desiderata in medical knowledge. This country was never blessed with a more splendid list of medical names than those which now occupy the walks of this profession; but I will surely be indulged in soliciting their attention to two subjects intimately connected with the public health, and the happiness of thousands.

The consumption is the most destructive disease in the northern states. One ninth of the deaths in New-Haven are occasioned by it. According to the bills of mortality of 1313, out of seven hundred and eighty-six deaths in Boston, one hundred and ninety-three were caused by the consumption; out of two thousand two hundred and ninety-one deaths in Philadelphia, two hundred and sixteen; and out of two thousand two hundred and ninety-nine deaths in New-York, five hundred and sixty-two. Is there no way of preventing or curing this disease? Must those labouring under pulmonary complaints be invariably driven to southern climes for relief? The physician who discovers an efficacious remedy for this terrible malady will have his name enrolled among the benefactors of the human race: it now exists the opprobrium medicorum, and sweeps into the grave, with unsparing fury, genius, youth, and beauty—all that can adorn, embellish, and illuminate society.†

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* See Note MM. † See Note NN.

Who does not recollect the terror and mortality which invariably accompany that horrible pestilence denominated the yellow fever? Under its iron reign we see persons fleeing from their homes in all directions, the insignia of death in every street, and the grave continually open to receive its miserable victims.

In this awful hour,

> ————"Mussabat tacito medicina timore."

> ————"In silence dread,
> Appall'd and doubtful, mus'd the healing art."
> LUCRETIUS.

And yet what clouds and darkness rest over the origin, nature, and cure of this pestilence. Whether it comes to us from abroad, or originates at home; whether it is contagious or not? are questions solemnly debated by the profession, and treatises of much learning and ingenuity have been written on both sides.* It is stated by Humboldt that a plague, called the matlazahuatl, prevails, about once in a century, among the Indian race in Mexico; that in 1545 eight hundred thousand died of it; and in 1576 two millions, and that it never attacks white people. Can this be the disease which swept off whole nations of our northern Indians before the European settlement of this country; and if it be true that the yellow fever, as is alleged, seldom if ever attacks the Mexican Indians, here is a very extraordinary field open for investigation.

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* See Note OO.

It would be a gigantic work to point out those subjects of investigation applicable to political science, and which demand attention from their peculiar application to this country, or from their general importance. Let me glance at a few. How far a representative government upon the federal principle may be extended; the extent of judicial independence; the arrangement of the elective franchise; the constitution of the executive power; the establishment of a veto, or qualified negative; the institution of an executive council; the organization of the appointing power; and the constitutional rotation of office. If we are astonished to find these principles in government so unsettled and so much afloat, we are equally surprised to learn that the very elements of political economy are still unknown or controverted. There is, in fact, much abstruse investigation, and much metaphysical subtlety in this science, and, perhaps, more terra incognita than in any other of equal importance. A mere hint at a few points will sufficiently illustrate this proposition.

The following among others are still subjects of speculation and controversy: What is national wealth? the means of producing it? the influence or action of the generating causes? their immediate or distant effects? their apparent or actual results? the different ramifications of the sources of wealth, such as labour, capital, the circulation of commodities or commerce? and the revenue or consumption? the source of wealth, whether in labour, foreign commerce, land, or capital stock? in what capital consists? the nature of money? the proportion which the circulating money of a country bears to the whole value of the annual produce circulated by it? Whether labour is the standard of value, and whether there is an immutable standard measure of value? whether agricultural labour is exclusively productive or most productive? and, perhaps, the most controverted subject of political economy is, whether the home or foreign commerce is most productive of national wealth?

I am persuaded that sufficient has been said to show that this institution embraces the most important objects of investigation, deeply, intimately, essentially, and extensively connected with the best interests of science, the prosperity of our country, and the dignity of man. It now remains that we should perform faithfully what we have undertaken voluntarily. The harvest is great, and the labourers are few. The cultivation of knowledge, like the cultivation of virtue, is its own reward.

> "Speak ye the pure delight, whose favour'd steps
> The lamp of science through the jealous maze
> Of nature guides, when haply you reveal
> Her secret honours: whether in the sky,
> The beauteous laws of light, the central powers,
> That wheel the central planets round the year;
> Whether in wonders of the rolling deep,
> Or the rich fruits of all-sustaining earth,
> Or fine-adjusted springs of life and sense,
> Ye scan the counsels of their author's hand."
>
> PLEASURES OF IMAGINATION, b. 2.

History and observation justify the remark that, while the movements of conquest have been from the north to the south, and the course of the precious metals from the west to the east, that the progress of the ocean and of the atmosphere, of the arts and sciences, and of the civilization of the human species, has been from the rising to the setting sun: and, according to the uniform experience of mankind, we have every reason to believe that our country will be the chosen seat, and favourite abode, of learning and science. May this association be a humble instrument in paving the way for this sublime result, and may posterity describe its origin, its progress, and its maturity, by adopting, with a small variation, the language of the Roman bard:

> "Mobilitate viget, viresque acquirit eundo:
> Parva metu primo; mox sese attollit in auras,
> Ingrediturque solo, et caput inter nubila condit."
>
> ÆNEID, lib. 4.

It grew strong by exertion, and acquired strength in its progress: small at first through diffidence, it soon sprung up into the sky, spread over the earth, and hid its towering head in the heavens.

NOTES

AND

ILLUSTRATIONS.

NOTE A.

I HAVE scarcely thought it worth while to refer to the book of M. De Paw, a Prussian, wherein he has copied the calumnies of Buffon against America, with additions and embellishments. This work, which was published in three volumes, has been amply refuted by Don Pernety, and the Abbé Clavigero. As a specimen of his accuracy it is sufficient to state, that he confidently asserts that dogs suffer so much under the deteriorating influence of our climate, that they lose the power of barking, and that all the plants of Europe have degenerated in America, except those which are aquatic and succulent.

If any person is desirous of seeing the essence of all the slanders against the United States, invented and propagated by ignorant and insignificant tourists, let him look at the eleventh article of the twentieth number of the London Quarterly Review, purporting to be a review of Inchiquin the Jesuit's Letters, but, in fact, an impotent effusion of malignity against our country, its morals, manners, intellect, and institutions. This diatribe is attributed to the pen of Southey the poet, and its whole force depends upon the liberal use of that commonplace sophism termed a false induction. From a few particulars disparaging to the country, he has inferred a general conclusion to its disadvantage: upon the faults of the few he predicates the vices of the many. Applying the same rule of judgment to himself, it would be easy to prove him the most wretched poetaster in Europe. If we look into his poems we will find, among some splendid effusions of genius, the most miserable conceits; and if, upon the selection of those offences against taste and good writing, we were to pronounce his poetical character, who would not condemn our candour as well as our logic?

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This tissue of falsehood and scurrilous invective states, that General Washington was in favour of a monarchy; that Mr. Jefferson exercised a pernicious influence over Mr. Adams; that Franklin was but a small philosopher; that Rittenhouse was an Englishman; that no such character as a respectable country gentleman is known in America; that it is impossible to bring a thief to justice, &c. These violations of truth were selected as we casually cast our eyes over this review, and they are brought forward as specimens of the whole performance. The authorities to which the writer has appealed for his slander, are some newspapers, the Works of William Cobbett, and the Travels of Janson, Priest, Ashe, Wansey, Weld, Lambert, and Parkinson. Scarcely one of these had any pretensions to literature. Ashe, if such a person ever existed, was, in all probability, never in this country; Priest came over as a musical adventurer; of Parkinson we may say, in the words of Congreve, "Ferdinand Mendez Pinto was but a type of thee, thou liar of the first magnitude." The others, under a more decent garb, are equally regardless of truth. The character of Cobbett is known in Europe, as well as in this country; if we are desirous of attaining truth we must reverse his assertions. Janson published his book in a quarto form in London, in 1807, under the title of "The Stranger in America, by Charles William Janson, late of the State of Rhode Island, Counsellor at Law;" but who, we learn from good authority, was a barber in that state. It abounds with offences against truth, and, considering his long residence in the United States, exhibits a great dearth of information, and a great want of intelligence: take, for example, an extract from the first page I have opened: "Soon after Mr. Jefferson's advancement to the presidency, the tithes of the episcopal clergy were entirely abolished, and the church lands sold for the use of government; all religious sects are, therefore, on the same footing, without supremacy or limited salaries."

As a conspicuous example of the reviewer's total disregard of candour and justice, I might refer particularly to his unworthy attack upon Messrs. Emmet, Sampson, and M'Nevin, whose genius, learning, and virtues, would reflect honour on any country.

NOTE B.

GOVERNOR BURNET was a man of extensive reading and information. He wrote a commentary on the Apocalypse, and made many useful astronomical observations. Swift's Discourse on the Mechanical Operation of the Spirit was supposed to be addressed to Governor Hunter. In the fifteenth volume of Swift's Works there are two letters from the dean to him. In the first epistle Swift says, "Sometimes Mr. Addison and I steal to a pint of bad wine, and wish for no third person but you; who, if you were with us, would never be satisfied without three more." In the second letter he says, "I am very much obliged to you for the favour of a kind reproach you sent me in a letter to Mr. Addison, which he never told me of till this day, and that accidentally; but I am glad at the same time that I did not deserve it, having sent you a long letter in return to that you was pleased to honour me with, and it is a pity it should be lost; for, as I remember, it was full of the diei fabulas, and such particularities as usually do not find place in newspapers." These quotations indicate the great intimacy between Hunter and those distinguished men.

The same volume contains two letters from Hunter to Swift, dated New-York, 1st and 14th of March, 1712–13, both breathing great discontent and uneasiness with his situation. In the last he says, "Here is the finest air to live upon in the universe, and, if our trees and birds could speak and our assemblymen be silent, the finest conversation too. Fert omnia tellus; but not for me; for you must understand, according to the custom of our country, the sachems are of the poorest of the people. I have got the wrong side of Sir Polidore's office; a great deal to do, and nothing to receive. In a word, and to be serious at last, I have spent three years of life in such torment and vexation that nothing in life can ever make amends for it."

Hunter was afterwards appointed Governor and Captain General of Jamaica, in the room of the Duke of Portland, who died there in 1726.

NOTE C.

The first institution in the United States established as a repository of the native vegetable productions of this country, and for the purpose of naturalizing such foreign plants as are distinguished by their utility either in medicine, agriculture, or the arts, was the Elgin Botanic Garden, founded in 1801, by Dr. David Hosack, at that time Professor of Botany and Materia Medica in Columbia College. This establishment is situated about three miles from the city of New-York, on the middle road between Bloomingdale and Kingsbridge. The ground, consisting of about twenty acres, was originally purchased of the corporation of this city. The view from the most elevated part is variegated and extensive, and the soil itself of that diversified nature as to be particularly adapted to the cultivation of a great variety of vegetable productions.

Speaking of the particular situation of the Botanic Garden of this state, a British writer, in the London Medical and Physical Journal, among other remarks, has the following:

"No region of the earth seems more appropriate to the improvement of botany, by the collecting and cultivating of plants, than that where the Elgin Botanic Garden is seated. Nearly midway between the northern and southern extremities of the vast American continent, and not more than forty degrees to the north of the equator, it commands resources of incalculable extent; and the European botanist will look to it for additions to his catalogue of the highest interest. The indigenous botany of America possesses most important qualities, and to that, we trust, Professor Hosack, the projector, and, indeed, the creator, of this garden, will particularly turn his attention. It can hardly be considered as an act of the imagination, so far does what has already been discovered countenance the most sanguine expectations, to conjecture, that in the unexplored wilderness of mountain, forest, and marsh, which composes so much of the western world, lie hidden plants of extraordinary forms and potent qualities."

Soon after the purchase, the proprietor, at a very considerable expense, had the ground cleared and put in a state of cultivation, arranged in a manner the best adapted to the different kinds of vegetables, and planted ageeably to the most approved style of ornamental gardening. A conservatory for the preservation of the more hardy greenhouse plants was also built. At the commencement of 1805 nearly fifteen hundred species of American plants, beside a considerable number of rare and valuable exotics, were in cultivation in this institution. In 1806 very important additions were made to this collection of plants from various parts of Europe, as well as from the East and West Indies. A second building for their preservation was also erected, and the foundation of a third was laid, which was completed in the following year. In the autumn of the same year, 1806, a catalogue of the plants, both native and exotic, which had been already collected, and which amounted to nearly two thousand, was published. Since that time the Botanic Garden has been greatly improved. The buildings, which are erected on the most recent plan adopted in institutions of this kind, consist of three large and well-constructed houses, exhibiting a front of one hundred and eighty feet. The greater part of the ground is brought in a state of the highest cultivation, and divided into various compartments, calculated for the instruction of the student of botany and medicine, and made subservient to agriculture and the arts. A greater part of the establishment is surrounded by a belt of forest trees and shrubs, and these again are enclosed by a stone wall two and a half feet in thickness, and seven feet in height.

The expense requisite to effect these several purposes far exceeding the calculations the proprietor had originally formed, and being desirous of perpetuating the institution,

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he was induced to offer the whole establishment for sale to the state. An almost entire unanimity prevailing among the medical faculty relative to the advantage to be derived from an institution of the kind, as highly necessary to complete a system of medical instruction, and similar sentiments being entertained by many others who felt an interest in the literary reputation of the state, application was made to the legislature that provision might be obtained for the purchase of the Botanic Garden. On this occasion memorials were presented by the state medical society, the medical society of the city and county of New-York, and of the counties of Duchess, Ulster, Niagara, Saratoga, Clinton, &c. by the corporation of the city, the governors of the New-York Hospital, the students attending the medical schools, and from many of the most respectable inhabitants of this city; and the zeal manifested upon this subject reflects much credit upon the officers and members of these respective associations. The Botanic Garden accordingly became the property of the state of New-York, by an act of their legislature, passed on the 12th of March, 1810. The honourable the regents of the university, immediately upon this purchase being effected, allotted that extensive botanical establishment to the use of the College of Physicians and Surgeons, for the laudable purpose contemplated by the legislature. The late proceedings of the legislature, in relation to the Botanic Garden, have been stated elsewhere. It is proper to add that the enterprising and public-spirited founder of this institution, Dr. Hosack, in 1811, published a second edition, enlarged, of the *Hortus Elginensis, or a Catalogue of the Plants, indigenous and exotic, cultivated in the Elgin Botanic Garden*, arranged in alphabetical order, and embracing the generic and specific names of Linnæus, the synonymes of various authors, the popular appellations by which they are known, the use of the different plants in medicine and the arts, &c. See a *Statement of Facts relative to the Establishment and Progress of the Elgin Botanic Garden, and the Subsequent Disposal of the same to the State of New-York; Hortus Elginensis: American Medical and Philosophical Register, vol.* 2. from which most of the preceding account has been taken.

It is ardently hoped that an institution so honourable to the individual by whom it was originally projected, and by whose care and munificence it has been eminently conducive to the promotion of the science of botany, may not be impaired in its character or usefulness through any want of public support; and it is respectfully suggested that nothing could more effectually secure the important objects of this institution than some permanent provision made by the legislature, and the annexation to the establishment of a botanical professorship.

NOTE D.

The science of medicine is prosecuted with distinguished success in this country; and the contributions which it has received from its cultivators in different parts of the United States are numerous and highly important. To enter into a detail of those circumstances which modify the character of the diseases of America, and to state the different methods of treatment which appears to be indicated upon the difference of type in our disorders when compared with diseases of the like nature prevailing in other latitudes, would lead to an extent of remark altogether beyond the limits prescribed on this occasion. The present note is intended to embrace only some of the leading circumstances connected with the origin, progress, and present condition of medical science in this state.

The first essay made in the United States for the purpose of imparting anatomical knowledge by means of dissection, was made in New-York, by Doctors John Bard and Peter Middleton, two of the most distinguished practitioners of this city. The first attempt towards the promotion of a medical school in the State of New-York was made in the year 1767, during the administration of Sir Henry Moore and Lieutenant Governor Colden. In the following year the medical school was organized, under the direction and government of the college of the province, then called King's College, and a body of able professors appointed to teach the several branches of medical science. Among the professors we find Samuel Bard, Peter Middleton, and Samuel Clossey, names familiarly known to those acquainted with the medical annals of North America. In 1769, in consequence of a public address delivered by Dr. Samuel Bard, a very important addition was made to the means of medical education then afforded, by the establishment of the New-York Hospital. The great advantages which the medical school of New-York thus possessed were, however, but of temporary duration: the revolutionary war occasioned a suspension of the salutary labours of the professors connected with the school; the teachers and students were scattered, and the college converted by the enemy into a military hospital. After the peace of 1783 the former medical professors were never as a body reinstated in their situation in the college, they having been separated either by accident or death. An attempt to revive the medical school in the following year proving ineffectual, the design was relinquished until 1792. In this year Columbia College was made to embrace two faculties: a faculty of arts, and another of physic; over the former presided William Samuel Johnson, LL. D., a gentleman in every respect

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qualified to the station; at the head of the latter continued, for some time, the learned and distinguished Samuel Bard, M. D. as dean. Among the professors who were appointed to deliver lectures on the different branches of medicine, were several gentlemen of acknowledged talents and great professional merit. The exertions of the trustees of Columbia College, in their annexing a medical school to that institution, are deserving of the highest commendation; and it cannot be denied that the science of medicine was promoted by its establishment, particularly in this state.

By an act passed by the legislature of this state in March, 1791, the Hon. the Regents of the University were authorized to institute a College of Physicians and Surgeons. The power thus vested in them they thought proper to exercise in 1807; and, accordingly, a charter for the purpose of establishing a College of Physicians and Surgeons in the city of New-York was granted, bearing date the 12th of March, 1807. The establishment of an institution to be exclusively devoted to the cultivation and diffusion of medical science, under the patronage of the Regents of the University, and its sanction by the legislature, were circumstances viewed with the greatest satisfaction, and afforded just cause of congratulation to the friends of science throughout the state. That the high expectations which were entertained of the benefits that would flow to the community from its establishment were well founded, the history of the college during the time it has been in operation presents the most conclusive evidence. In November, 1807, the business of the medical college commenced, and courses of instruction were delivered on all the branches of medicine. The ability and success with which the teachers filled the important stations assigned them was such, that the legislature, at their next session, made the liberal appropriation of twenty thousand dollars, for the benefit of the college. The whole number of students who attended to the institution the *first* year was fifty-three; the *second* year there was seventy-two students, a greater number than had ever before resorted to a similar institution for medical instruction in this city: the *third* year the college was attended by seventy-three students from New-York, and other states in the union.

In 1810 the rapid progress of the college in its importance and usefulness received a temporary check, and its brilliant prospects were, for a while, overcast, owing to certain misunderstandings having taken place between the then president and professors. The Regents of the University, upon receiving authentic information of the dissensions which had thus been created, with the same laudable zeal for the promotion of medical science with which they had originally been induced to organize the establishment, immediately adopted measures for ascertaining the cause of the mischief, and for the removal of every obstacle which might retard its prosperity. This they did at their meeting held at

Albany on the 1st of April, 1811. Upon the reorganization of the College of Physicians and Surgeons, at this period, the venerable Samuel Bard, M. D. was appointed president; material alterations were made in several of the professorships, and important changes were effected as to the internal government of the institution. The Elgin Botanic Garden, founded by Dr. Hosack, and lately purchased by the state, was now committed to the college by the regents, for the laudable purpose of promoting medical science; the legislature also during this year made a further grant of five hundred dollars per annum for the benefit of the college. About this time power was granted the college to confer degrees in medicine.

In noticing the condition of the college in 1812, the Regents of the University, in their report to the legislature, observe, "The organization of the College of Physicians and Surgeons has been improved, and it now presents a fair prospect of speedily rising to a state of usefulness and celebrity, such as may be justly expected from the importance of the community in which it is situated, and the government under whose auspices it has been erected. A gentleman universally acknowledged among the first in the medical profession in America, has consented to be placed at the head of it, and professors of the best talents have been procured to deliver instruction in it."

The importance of the services rendered the college by the late measures of the regents and the legislature soon became apparent. On the 15th of May, 1811, the first medical commencement in the institution was held, and the degree of doctor of medicine granted to eight students, who had previously undergone the necessary examinations prescribed by its laws, and publicly defended their respective inaugural dissertations. This was a greater number of degrees in medicine than was ever before granted at one time in this city. Since that time twenty-seven gentlemen have received the honours of the medical doctorate in this college, all of whom had received their education there. Of the whole number of graduates seven have published their inaugural dissertations.

In order most effectually to augment still further the means of medical education afforded by the college, the board of trustees, in May, 1813, appropriated a considerable part of their funds to the purchase of ground as a permanent situation for the college, and completed the elegant and commodious building which they now occupy in Barclay-street. The anatomical, the chemical, the natural history, and other departments of the college, which had, at different times, been enlarged, were also most materially improved and enriched.

In September, 1813, one of the most important and desirable events took place which has ever been recorded in our medical annals; the consolidation of the two medical schools of this city into one great establishment for the promotion of medicine. In their

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address of the above date the College of Physicians and Surgeons state that a union has been honourably entered into between them and the Faculty of Medicine of Columbia College. The trustees of Columbia College accordingly, soon after, annulled their statutes which authorized the connexion of a medical school with their institution, and the Regents of the University, in March, 1814, confirmed the agreement which had been entered into between the College of Physicians and Surgeons, and the Medical Faculty of Columbia College.

Ample courses of instruction, on the following branches of science, are now provided by the state medical school of this city: *Anatomy, Physiology, and Surgery; Theory and Practice of Physic and Clinical Medicine; Chemistry; Principles and Practice of Surgery; Clinical Medicine; Materia Medica; Midwifery, and the Diseases of Women and Children; Medical Jurisprudence; Natural History; Natural Philosophy.*

The legislature of this state, with the wonted liberality they have uniformly manifested for the promotion of useful knowledge, at their last session authorized the raising of the further sum of thirty thousand dollars, to be applied to the purposes of the College of Physicians and Surgeons of this city. It is not deemed necessary here to recount the great advantages which the city of New-York possesses for a great medical establishment. With a population equal to that of most of the capitals of Europe, and composed of inhabitants from all parts of the world; with a large and well-endowed hospital, and other public charities; its botanic garden; its well-organized medical school; the extensive system of education which it embraces; and its learned and able teachers, induce the belief that the College of Physicians and Surgeons is second to no medical establishment in the United States; and in their choice of such a place for the special cultivation of medicine, the Regents of the University have manifested the wisdom of their heads, and the excellence of their hearts. For further particulars relative to the progress of medicine in this state, see *Middleton's Medical Discourse, Bard's Address, Historical Sketch of the College of Physicians and Surgeons,* in *Amer. Med. and Phil. Register,* and other parts of the same work; *Hosack's Account of the Med. Schools of New-York and Philadelphia; Syllabus of the several Courses of Lectures delivered in the Col. of Phys. and Surg. N. Y.* 1814; *Reports of the Regents of the University.*

NOTE E.

The Society for the Promotion of Useful Arts has published three volumes of its Transactions at the expense of the state, containing a great body of useful information, relative to the husbandry and manufactures of the country. The Academy of Arts, principally for want of a suitable place to exhibit its collections, has not prospered in proportion to its importance. If the application to the corporation of the city to assign spacious apartments for this institution, and the Literary and Philosophical, and Historical Societies, shall succeed, (and, from the invariable public spirit displayed by that body, there is every reason to believe it will,) and if the plan for establishing professorships in painting, sculpture, engraving, architecture, &c. shall also be carried into effect, there can be no doubt but that (notwithstanding the unpropitious state of things for the cultivation of the arts and sciences) this useful establishment will flourish. The New-York Historical Society was established, in imitation of a similar institution in Massachusetts, for the purpose of collecting materials for illustrating the natural, civil, ecclesiastical, literary, and medical history of America. The Massachusetts society has published ten volumes of interesting matter; that of New-York, beside publishing two volumes, has made a rare, invaluable, and extensive collection of books, pamphlets, manuscripts, newspapers, maps, medals, &c. worth at least ten thousand dollars, for which it is greatly indebted to the indefatigable exertions of John Pintard, Esq. the Rev. Timothy Alden, and Dr. John W. Francis. The legislature of the state, deeply impressed with the importance and merits of this establishment, and under the influence of a magnanimous policy, conferred upon it last year a donation of twelve thousand dollars, which will insure its permanent usefulness. The congress of the United States have also directed the public documents to be sent gratuitously to the several Historical Societies, and the legislature of New-York have made a similar arrangement respecting this institution.

NOTE F.

The agency of Dr. Franklin, in projecting and arranging the American Philosophical Society, will be seen by the following interesting document, with which I have been favoured by Cadwallader D. Colden, Esq. the distinguished grandson of the late Dr.

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Colden. I here publish this paper from the copy originally transmitted to Lieutenant Governor Colden, by the celebrated American botanist, John Bartram. In this communication Franklin makes mention of himself as the writer of the *proposal;* and it is highly probable that the first idea of the institution originated with him. In a subsequent letter of Dr. Franklin, dated New-York, April 5, 1744, addressed to Dr. Colden, and published in the American Medical and Philosophical Register, vol. 2. Franklin states, that "so far as it relates to Philadelphia, the society is formed, and has had several meetings to mutual satisfaction." Among the members at that time we find Thomas Godfrey, the mathematician, William Parsons, the geographer, John Bartram, botanist, James Alexander, Esq. of New-York, and Thomas Hopkinson, as president of the society. About this period Dr. Colden became an active and most useful associate in this confederacy for the promotion of useful knowledge in British America.

"A PROPOSAL *for Promoting Useful Knowledge among the British Plantations in America.*

THE *English* are possessed of a long tract of continent, from *Nova Scotia* to *Georgia*, extending north and south through different climates, having different soils, producing different plants, mines, and minerals, and capable of different improvements, manufactures, &c.

The first drudgery of settling new colonies, which confines the attention of people to mere necessaries, is now pretty well over; and there are many in every province in circumstances that set them at ease, and afford leisure to cultivate the finer arts, and improve the common stock of knowledge. To such of these who are men of speculation, many hints must from time to time arise, many observations occur, which, if well examined, pursued, and improved, might produce discoveries to the advantage of some or all of the *British* plantations, or to the benefit of mankind in general.

But as, from the extent of the country, such persons are widely separated, and seldom can see and converse, or be acquainted with each other, so that many useful particulars remain uncommunicated, die with the discoverers, and are lost to mankind; it is, to remedy this inconvenience for the future, proposed,

That one society be formed of virtuosi, or ingenious men, residing in the several colonies, to be called *The American Philosophical Society;* who are to maintain a constant correspondence.

That *Philadelphia*, being the city nearest the centre of the continent colonies, communicating with all of them northward and southward by post, and with all the islands by sea, and having the advantage of a good growing library, be the centre of the society.

That at *Philadelphia* there be always at least seven members; *viz.* a physician, a botanist, a mathematician, a chemist, a mechanician, a geographer, and a general natural philosopher, beside a president, treasurer, and secretary.

That these members meet once a month, or oftener, at their own expense, to communicate to each other their observations, experiments, &c. to receive, read, and consider such letters, communications, or queries, as shall be sent from distant members; to direct the dispersing of copies of such communications as are valuable, to other distant members, in order to procure their sentiments thereupon, &c.

That the subjects of the correspondence be, all new-discovered plants, herbs, trees, roots, &c. their virtues, uses, &c. methods of propagating them, and making such as are useful, but particular to some plantations, more general. Improvements of vegetable juices, as ciders, wines, &c. New methods of curing or preventing diseases. All new-discovered fossils in different countries, as mines, minerals, quarries, &c. New and useful improvements in any branch of mathematics. New discoveries in chemistry, such as improvements in distillation, brewing, assaying of ores, &c. New mechanical inventions for saving labour; as mills, carriages, &c. and for raising and conveying of water, draining of meadows, &c. All new arts, trades, manufactures, &c. that may be proposed or thought of. Surveys, maps, and charts of particular parts of the sea-coasts, or inland countries; course and junction of rivers and great roads, situation of lakes and mountains, nature of the soil and productions, &c. New methods of improving the breed of useful animals; introducing other sorts from foreign countries. New improvements in planting, gardening, clearing land, &c. And all philosophical experiments that let light into the nature of things, tend to increase the power of man over matter, and multiply the conveniences or pleasures of life.

That a correspondence, already begun by some intended members, shall be kept up by this society with the Royal Society of *London*, and with the Dublin Society.

That every member shall have abstracts sent him quarterly, of every thing valuable communicated to the society's secretary at *Philadelphia*, free of all charge except the yearly payment hereafter mentioned.

That by permission of the postmaster-general, such communications pass between the secretary of the society and the members, postage free.

That for the defraying the expense of such experiments as the society shall judge proper to cause to be made, and other contingent charges for the common good, every

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member send a piece of Eight *per annum* to the treasurer, at *Philadelphia*, to form a common stock, to be disbursed by order of the president with the consent of the majority of the members that can conveniently be consulted thereupon, to such persons and places where and by whom the experiments are to be made, and otherwise, as there shall be occasion; of which disbursements an exact account shall be kept, and communicated yearly to every member.

That at the first meetings of the members at Philadelphia, such rules be formed for regulating their meetings and transactions for the general benefit as shall be convenient and necessary; to be afterwards changed and improved as there shall be occasion, wherein due regard is to be had to the advice of distant members.

That at the end of every year, collections be made and printed, of such experiments, discoveries, improvements, &c. as may be thought of public advantage; and that every member have a copy sent him.

That the business and duty of the secretary be, to receive all letters intended for the society, and lay them before the president and members at their meetings; to abstract, correct, and methodize such papers, &c. as require it, and as he shall be directed to do by the president, after they have been considered, debated, and digested in the society; to enter copies thereof in the society's books, and make out copies for distant members; to answer their letters by direction of the president, and keep records of all material transactions of the society, &c.

Benjamin Franklin, the writer of this Proposal, offers himself to serve the society as their secretary, till they shall be provided with one more capable.

Philadelphia, *May* 14, 1743."

NOTE G.

The appearance of the lands belonging to the Holland Company, particularly from Batavia to Lake Erie, furnishes strong indications of the recession of that lake. Near Vendeventer's tavern, in Niagara county, about twenty-two miles from the lake, there is a perpendicular descent which is said to extend from the Genesee river to Black Rock; between it and the Stone Ridge, which runs from the Genesee river to Lewiston, there is an immense valley, twenty miles across, called Tonewanto Valley. The precipice at Vandeventer's is from one hundred to two hundred feet, composed principally of limestone and flint, combined like those on Bird Island, at the outlet of the lake, and bearing every mark of the attrition and abrasion of the waves. The rocks are scooped out by the water. On digging a cellar here, a great collection of lakesand, and another of gravel, were found. Might not Lake Erie have formerly covered the Tonewanto Valley, and formed an immense bay, when the Niagara Falls were at Queenstown? and on the recession of the cataract, might not Lake Erie have retreated from the valley? Perhaps the stone ridge was the boundary between Lakes Erie and Ontario? or might not Lake Erie have formerly discharged itself by the Tonewanto Valley into the Genessee river? It is, however, believed by some that this lake formerly discharged itself by the Chicaga creek, and Illinois and Mississippi rivers, into the Gulf of Mexico, before the supposed barrier at Lewiston was broken down. Between Vendeventer's and this precipice are to be found a great variety of fossil shells and petrefactions, embedded in limestone.

On another occasion I made the following statement in relation to Lake Ontario: "From near the Genesee river to Lewiston, on the Niagara river, there is a remarkable ridge, or elevation of land, running almost the whole distance, which is seventy-eight miles, and in a direction from east to west. Its general altitude above the neighbouring land is thirty feet, and its width varies considerably; in some places it is not more than forty yards. Its elevation above the level of Lake Ontario is, perhaps, one hundred and sixty feet, to which it descends by a gradual slope, and its distance from that water is between six and ten miles. There is every reason to believe that this remarkable ridge was the ancient boundary of this great lake. The gravel with which it is covered was deposited there by the waters, and the stones everywhere indicate by their shape the abrasion and agitation produced by that element. All along the borders of the western rivers and lakes there are small mounds, or heaps of gravel, of a conical form, erected by the fish for the protection of their spawn: these fish banks are found at the foot of the ridge, on the side towards the lake; on the opposite side none have been discovered. All rivers and streams which enter the lake from the south have their mouths affected with sand in a peculiar way, from the prevalence and power of the northwesterly winds. The points of the creeks which pass through the ridge correspond exactly in appearance with the entrance of the streams into the lake. These facts evince, beyond doubt, that Lake Ontario has receded from this elevated ground; and the cause of this retreat must be ascribed to its having enlarged its former outlet, or to its imprisoned waters (aided, probably, by an earthquake) forcing a passage down the present bed of the St. Lawrence." *Collections of the New-York Historical Society, vol.* 2.

The little falls on the Mohawk river, in connexion with the surrounding country, exhibit a very interesting aspect. As you approach the falls the river becomes narrow and deep, and you pass through immense rocks principally of granite interspersed with limestone. In various places you observe profound excavations in the rocks made by the agitation of pebbles in the fissures, and in some places the river is not more than twenty yards wide. As you approach the western extremity of the hills you find them about half a mile distant from summit to summit, and at least three hundred feet high. The rocks are composed of granite, and many of them are thirty or forty feet thick, and the whole mountain extends, at least, half a mile from east to west. You see them piled on each other like Ossa on Pelion, and in other places huge fragments scattered about, indicating evidently a violent rupture of the waters through this place, as if they had been formerly dammed up and had forced a passage; and in all directions you behold great rocks exhibiting rotundities, points, and cavities, as if worn by the violence of the waves, or hurled from their ancient positions.

The general appearance of the little falls indicates the former existence of a great lake above, connected with the Oneida lake; and as the waters forced a passage here and receded, the flats above were formed and composed several thousand acres of the richest land. Rome being the highest point on the lake, the passage of the waters on the east side left it bare, the Oneida lake gradually receded on the west side, and formed the great marsh or swamp, now surrounding the waters on Wood creek. The physiognomy of the country from the commencement of Wood creek to its termination in the Oneida lake, confirms this hypothesis. The westerly and northwesterly winds continually drive the sand of the lake towards the creek, and you can distinctly perceive the alluvions increasing eastward by the accumulation of sand, and the formation of new ground. Near the lake you observe sand without trees; then to the east a few scattering trees, and as you proceed in that direction the woods thicken. The whole country from the commencement to the termination of Wood creek looks like made ground. In digging the canal in Wood creek, pine trees have been found twelve feet deep. An old boatman several years ago said that he had been fifty years in that employ, and that the Oneida lake had receded half a mile within his memory. William Colbreath, one of the first settlers at Rome, in digging a well found a large tree at the depth of twelve feet. This great lake breaking down in the first place the barriers which opposed the progress of its waters to the east, and then gradually receding to the west, is a subject well deserving of minute investigation.

It is supposed that the Hudson river opened a new route for itself by prostrating the mountains at the Highlands, and that its former course lay through one of the valleys to the west.

Among similar instances which might be adduced, as having occurred in the old world, I might refer to the Caspian Sea and Lake Aral, which were supposed to have been formerly united. The Caspian Sea is three hundred leagues long, and fifty broad. Lake Aral about one hundred leagues long, and fifty broad; the latter is about one hundred leagues east of the former; the intervening country is a sandy desert; neither have an outlet; both are salt, and the surplus waters are carried off by evaporation. The Caspian receives no rivers from the east, and Lake Aral none from the west. From these circumstances it is inferred that they were formerly united.

Since the cultivation of our country great changes have taken place in rivers, streams, and small lakes. Some that were formerly full of water are nearly dry, and others are entirely so. These changes will proceed, and they may be ascribed to the following causes:

1. The cutting down of the woods, and the draining of swamps, expose the waters to the power of the sun, and dry up the sources from whence they proceed.

2. Cultivation increases the alluvions of rivers, &c. by loosening the soil, and depriving it of the trees and plants which prevented it from being carried off by the water.

NOTE H.

The fossil shells and petrifactions which have been discovered all over the world, on the loftiest mountains as well as in the bowels of the earth, are justly considered as the most interesting phenomena of nature. Linnæus says, that "the innumerable petrifactions of foreign animals, and of animals never seen by any mortal in our day, which often lie hid among stones under the most lofty mountains, are the only *remaining fragments of the ancient world.*" Buffon denominates them the *monuments*, and Pallas styles them the *medals, of nature*. Dr. Barton has expressed this idea in the following impressive language: "I consider the petrifactions and impressions which are found on many of our mountains, as some of the most interesting medals of the revolutions which our country has undergone."

This country furnishes these medals of nature in as great variety and abundance as any in the world. They are found in a number of forms; 1. The fossil shell detached from any other substance; 2. The real shell embedded in, or adhering to, stone; 3. The impressions on stone of the elevated and concave surfaces of the shells, without any vestige of them.

Kalm made many interesting discoveries of petrifactions in the northern parts of this state. On the mountains at Crown Point, he found petrifactions of all kinds, and chiefly pectinites, or petrified ostrea pectines; and sometimes whole strata of the latter, consisting merely of a quantity of shells of this sort grown together, generally small, and never exceeding an inch and a half in length. Some of the shells were very elevated, especially in the middle, where they formed, as it were, a lump; others again were depressed in the middle; but in most of them the outward surface was remarkably elevated, and the furrows always run longitudinally from the top diverging to the margin. These petrifactions were principally found in black limestone, lying in lamellæ, as slates do, and might be called a kind of slates convertible into quicklime by fire. The strata which lay uppermost in the mountains, consisted of a gray limestone. The black limestone is the marmor schistosum of Linnæus, and the schistus calcarious of Forster. Kalm also saw in this place many petrified cornua ammonis; among them were some petrified snails. Some of these cornua were remarkably large; for they measured above two feet in diameter. Different kinds of coral could be plainly seen, and separated from the stone in which they lay: some were white and lithophytes; others were starry corals, or madrepores.

In one place, near the shore of Lake Champlain, he saw a number of petrified cornua ammonis, in gray limestone. Some of this stone contained a number of petrifactions, with and without shells, and in one place he found prodigious large cornua ammonis about twenty inches in breadth. In some instances the water had worn off the stone, but could not have the same effect on the petrifactions which lay elevated above, and in a manner glued on the stones. *Kalm's Travels, vol.* 3.

The principal seat of these fossils and petrifactions are calcarious stones; this arises from the preserving power of the substance; but I have seen very curious ones in sandstone on lot No. 69. of the Cayuga reservation, in the county of Cayuga. This place is about three and a half miles from the Cayuga Lake. A ridge of rocks and stones extends a mile in a parallel direction with the lake. The higher stratum is composed of limestone, and the next adjoining one of sandstone, filled with marine substances. There is but one stratum of sandstone, of the thickness of two or three feet, and below and beneath, as well as above it, there is limestone. The sandstone contains several strange marine shells, which I should, therefore, pronounce to be oceanic. There are littoral ones also, such as scallops and periwinkles. One strange substance is larger than a scallop, and one is like the great crab called a horseshoe in miniature. From the propinquity of the limestone I should suppose that the sand and marine substances were connected together by a solution of the calcarious matter. Some of the stones were probably ejected by torrents from the regular layers. The sandstones are found singly all over the adjacent fields, are easily broken, and when pounded or burnt are converted into fine marine sand. They are not only indented with the figures of shells, but contain the shells themselves in a petrified form.

These petrifactions are certainly worthy of a more minute examination. Dr. Smith considered a very extensive collection of fish in sandstone, in the possession of an apothecary of Verona, a very great curiosity. I have no doubt but that a very interesting one of shells might be made from these immense strata of sandstone. *Vide J. E. Smith's Sketch of a Tour on the Continent, vol. 3.*

NOTE I.

In the country about Salina, the place where the principal manufactory of salt is, there are immense quantities of gypsum. It appears that there is some natural affinity between gypsum and salt. Mr. Pennant thus speaks of Northwich, a small town long famous for its rock salt and brine pits: "The stratum of salt lies about forty yards deep. Above the salt is a bed of whitish clay (argilla cœrula-cinerea) used in making the Liverpool earthen ware, and in the same place is also dug a good deal of the gypsum, or plaster stone. The fossil salt is generally yellow and semi-pellucid, sometimes debased with a dull, greenish earth, and is often found, but in small quantities, quite clear and colourless." *Tour in Scotland*, 1769.

NOTE K.

It is highly probable that there are other springs of petroleum in other parts of the country. Large oil stones are found at the Indian Saw Mill, twelve miles up the Buffalo creek, strongly impregnated with Seneka oil. These stones are produced from bituminous springs flowing over beds of madrepores under ground. Pennant says, that petroleum, or rock oil, is found sometimes in the mines in Wales, has an agreeable smell, and is esteemed serviceable in rheumatic cases, if rubbed on the parts affected. The miners call it the Fairies' Butter. *Tour in Wales, vol.* 1.

But the most extraordinary bituminous springs of which we have any account, are in the Bernian Empire. In the Province of Arracan, Major Symes met with a considerable cluster of them, the depth of whose wells was about thirty-seven fathoms, and the column of oil contained in them generally as high as the waist of those who descended for the purpose of collecting it. *Symes's Embassy to Ava.*

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NOTE L.

Since writing this discourse I have been favoured with "A Discourse on some of the Principal Desiderata in Natural History, and on the best means of Promoting the Study of this Science in the United States," by Dr. Barton, of Philadelphia. I regret that I had not before the benefit of this ingenious and learned work, having been often instructed by other writings of this distinguished author. In this discourse he says, "Nor is the satisfactory decision of the question relative to the origin of the Americans beyond the reach of science. It is, indeed, a question which can only be fully decided by much labour and patience in research, aided by that candour which should be inseparable from the character of a genuine philosopher. For the investigation of this subject, we should lose no time in collecting vocabularies of the languages of the Indians, as well those with whom we have been long acquainted, as those who have recently become known to us, through the medium of the travels of Mr. Mackenzie, Captains Lewis, Clark, Freeman, and others. In this inquiry, too, it will be highly important to have an eye to the religious institutions and the mythology of the Americans. I have elsewhere stated that large fragments of the Asiatic mythology are preserved in a considerable degree of purity, in the most distant or opposite regions of America, on the shores of Lakes Superior and Ontario, and on the confines of the Plata and Maragnon."

In stating that there are thirty-five languages in Mexico I have followed Clavigero; Humboldt says there are but twenty. *Humboldt's New Spain, vol. 2.*

NOTE M.

Linnæus, in his celebrated Systema Naturæ, has divided animals into six classes:

1. Mammalia.
2. Birds.
3. Amphibia.
4. Fishes.
5. Insects.
6. Worms.

He distributes the class mammalia into seven orders:

1. Primates.
2. Bruta.
3. Feræ.
4. Glires.
5. Pecora.
6. Belluæ.
7. Cetæ.

And after describing the first order, primates, as having cutting foreteeth, four parallel upper teeth, and two pectoral teats, he divides it into

1. Homo.
2. Simia.
3. Lemur.
4. Vespertilio. *Turton's Translat n, vol. 1.*

Several new systems have been formed, the most esteemed of which are those of Blumenbach and Cuvier.

Blumenbach's is as follows:

There are two grand divisions of animals; those which have a vertebral column and red blood, and those which have no vertebræ and are white blooded.

He subdivides vertebral animals into the warm and cold blooded, and makes two classes of warm-blooded animals:

1. Mammalia.
2. Birds.

And he distributes the class mammalia into six orders:

1. Bimanum; two handed animals.
2. Quadrumana; four handed animals.
3. Bradypoda; slow-moving animals.
4. Cheiroptera; having the fingers elongated for the expansion of a membrane, which acts as a wing.
5. Glires; gnawing animals.
6. Feræ; predaceous and carnivorous animals.

For all the outlines see the *Introduction to Blumenbach's Short System of Comparative Anatomy, by William Lawrence.*

Cuvier, also, divides the animal kingdom into two great families; 1. Animals which have vertebræ and red blood; 2. Animals without vertebræ, almost all of which have white blood.

He subdivides vertebral animals into two branches; those with warm blood and those with cold blood.

Each of these two branches is divided into two classes. Those of the animals with warm blood are,

1. Mammalia.
2. Birds.

The classes of vertebral animals with cold blood are,

1. Reptiles.
2. Fishes.

The invertebral animals ought to be divided into five classes:

1. Mollusca.
2. Crustacea.
3. Insects.
4. Terrestrial worms and leeches.
5. Zoöphyta.

He then divides the class mammalia into the following orders:

1. Cetacea.
2. Ruminantia; all cloven-footed.
3. Pachydermata; more than two toes to the foot; incisive teeth in both jaws, and frequently enormous canine teeth.
4. Solipeda; having only one apparent toe to each foot.
5. Tardigrada; toes united by the skin and cannot be moved separately; no dentes incisores.
6. Edentata; resembling the former in the little freedom of the toes, and the want of the incisores; have a simple stomach.
7. Rodentia; claws; long incisive teeth at the end of each jaw, without any canine teeth.
8. Sarcophaga; like the former in the claws, but a more complete set of teeth; incisores short and strong; canine teeth and molares.
9. Amphibia.
10. Bats.
11. Quadrumana, which of all the mammiferous animals are those that most resemble man.

For the remaining outlines of this system see *G. Cuvier's Lectures on Comparative Anatomy, translated by William Ross, vol.* 1. *art.* 5.

NOTE N.

THE traditions of the Indians, and the speculations of philosophers, respecting this enormous animal, have been various, and, perhaps, on the whole, unsatisfactory. It is certain that the Indians had some notions respecting the mammoth, which they might have derived from tradition, or, after seeing its remains, they might have invented the fables which exist. Charlevoix, in his Voyage to North America, (*vol.* 1.) says, "There is also a very diverting tradition among the Indians of a great elk of such a monstrous size, that the rest are like pismires in comparison of him; his legs, they say, are so long that eight feet of snow are not the least encumbrance to him; his hide is proof against all manner of weapons, and he has a sort of arm proceeding from his shoulders which he uses as we do ours. He is always attended by a vast number of elks, which form his court, and which render him all the service he requires." This description respecting the arm appears like the proboscis of an elephant. Kalm, who travelled in this country in 1749, says, "Some years ago a skeleton of an amazing great animal had been found in that part of Canada where the Illinois live on the river Ohio. The Indians were surprised at the sight of it; and when they were asked what they thought it was, they answered that it must be the chief or father of all the beavers. It was of prodigious bulk, and had thick white teeth about ten inches long. It was looked upon as the skeleton of an elephant. A French lieutenant in the fort, who had seen it, assured me that the figure of the whole snout was yet to be seen, though it was half mouldered. He added that he had not observed that any of the bones were taken away, but thought the skeleton lay quite perfect there. I have heard people talk of this monstrous skeleton in several other parts of Canada." *Kalm's Travels, vol.* 3.

During the revolution a delegation of warriors from the Delaware tribe told the governor of Virginia that it was a tradition handed down from their fathers, "that, in ancient times, a herd of these tremendous animals came to the big bone licks and began an universal destruction of the bear, deer, elk, buffaloes, and other animals which had been created for the use of the Indians; that the Great Man above, looking down and seeing this, was so enraged, that he seized his lightning, descended on the earth, seated himself on a neighbouring mountain, on a rock of which his seat and the print of his feet are still to be seen, and hurled his bolts among them till the whole were slaughtered, except the big bull, who, presenting his forehead to the shafts, shook them off as they fell; but missing one at length, it wounded him in the side; whereon springing round, he bounded over the Ohio, over the Wabash, the Illinois, and finally over the great lakes, where he is living at this day." *Jefferson's Notes on Virginia.*

In the year 1748, M. Fabri, who had made great excursions into the northern parts of Louisiana and the southern regions of Canada, informed Buffon that he had seen heads and skeletons of an enormous quadruped, called by the savages the father of oxen; and that the thigh bones of these animals were from five to six feet in length." *Buffon's Natural History, translated by Smellie, vol. 9.*

In Siberia a similar animal was supposed to exist under ground, and many fables were related respecting it under the Russian name of mammoth. Notwithstanding these traditions and reports, the attention of the philosophers of Europe was not fully drawn to this subject until 1765, when Mr. George Croghan saw, in the vicinity of a large salt marsh, on the country bordering on the Ohio, immense bones and teeth, and he sent some of them to England, where they immediately became the subject of speculation and discussion: before this similar bones were discovered in the Russian dominions. Dr. Hunter, a celebrated anatomist, from an examination of the teeth, pronounced them to belong to a carnivorous non-descript animal. Daubenton declared, at one time, that this animal was an elephant, and at another time thought that the teeth were those of an hippopotamus, and conceived that the animal partook of both those species, and was a real mule. Muller supposed that they belonged to certain unknown quadrupeds, denominated mammouts, or mammoths, from the Russian name, supposed to have been derived from the Hebrew behemoth. Buffon was of opinion that, independently of the elephant and hippopotamus, whose relicks are equally found in the two continents, another animal, common to both, has formerly existed, the size of which has greatly exceeded that of the largest elephants; and, at one period, he supposed that it was seven times larger. Pallas believed, that the bones found in Siberia were those of the elephant and rhinoceros, and said that those countries, which are now desolated by the rigours of intense cold, have formerly enjoyed all the advantages of the southern latitudes. Gmelin supposes, that vast inundations in the south had driven the elephants to the north, where they would all at once perish by the rigour of the climate. Others were of opinion that the tusk and skeleton belonged to the elephant, and the molares to the hippopotamus; as the grinders were not those of the former: some thought they were the bones of the hippopotamus only; others of a monster of the ocean; and the Abbé Clavigero says, "that they may, from what appears, have belonged to giants of the human, as well as of any other, race." Jefferson asserts "that the skeleton of the mammoth bespeaks an animal of five or six times the cubit volume of the elephant; and that the grinders are five times as large, are square, and the grinding surface studded with four or five rows of blunt points, whereas those of the elephant are broad and thin, and their grinding surface flat." To mention all the hypotheses and fables which this subject has produced, would be useless, and consume too much time; but I cannot omit stating two or three more on account of their whimsical absurdity. One writer says that the bones in question are the remains of certain angelic beings, the original tenants of this our terrestrial globe, in its primitive state, till, for their transgressions, both were involved in ruin, after which this shattered planet was refitted for its present inhabitants. Another imagines that, at some remote period, the place in which the bones were found might have laid in the track of a conqueror unknown to the historians of Europe; that it might have been the scene of a battle, and the animals in question part of the baggage train destroyed by slaughter or disease, and left in the hurry of flight, or of pursuit, to puzzle and set at defiance generations then unborn.

Within a few years a better opportunity has been afforded of forming just conclusions respecting this animal. Within the extent of a few miles nine or ten skeletons have been discovered at the bottom of marl pits, in Orange and Ulster counties, and (from the calcarious nature of the substance in which they were deposited) in a high state of preservation. One of these skeletons has been mounted and placed in its natural form, and with almost all the bones, in Peale's Museum, in Philadelphia. Its height over the shoulders is eleven feet; over the hips, nine feet; from the chin to the rump, fifteen feet; from the point of the tusks to the end of the tail, following the curve, thirty-one feet; length in a straight line, seventeen feet; length of the tusks, ten feet seven inches; weight of a grinder, four pounds ten ounces; of the whole skeleton, one thousand pounds.

In 1799, upon the shores of the Frozen Ocean, near the mouth of the river Lena, in Siberia, a Toungouse chief discovered, in the midst of a rock of ice, a substance which did not resemble the floating pieces of wood usually found there: he endeavoured in vain to discover what it was at that time: about the close of the second summer the melting of the ice enabled him to know that it was a mammoth; but he could not succeed in obtaining the tusks of the animal until the end of the 5th year, when the ice which enclosed it, having partly melted, the level became sloped, and this enormous mass, pushed forward by its own weight, fell over upon its side on a sand bank. In March, 1804, the Chief Schoumachoff obtained the tusks and sold them for fifty roubles. In the summer of 1806, Michael Adams, a member of the Academy of St. Petersburgh, visited the mammoth in company with the chief, and found it in a very mutilated state. The proprietor was content with the profit he had already derived from it, and the jakouts of the neighbourhood tore off the flesh, with which they fed their dogs. Ferocious animals, white bears of the north pole, gluttons, wolves, and foxes, preyed upon it also, and their burrows were seen in the neighbourhood. The skeleton, almost completely unfleshed,

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was entire, with the exception of one of the forefeet. The spindyle, from the head to the os coccygis, a shoulder blade, the pelvis, and the remains of the three extremities, were still tightly attached by the ligaments of the joints, and by strips of skin on the exterior side of the carcass. The head was covered with a dry skin; one of the ears, well preserved, was furnished with a tuft of bristles. The eyes were also preserved, and the ball of the left eye could be distinguished. The tip of the under lip had been eaten away, and the upper part being destroyed, exhibited the teeth. The brain was still in the cranium, but it appeared dry. The parts least damaged were a forefoot and a hind one, covered with skin, and having still the sole attached. According to the assertion of the chief, the animal had been so large and well fed, that its belly hung down below the knee joints. This animal was a male, with a long mane at its neck; but it had no tail, and no trunk. The skin, three fourths of which Mr. Adams took with him, is a deep gray, and covered with a reddish hair, and black bristles, and was of such extraordinary weight, that ten persons moved it with great difficulty. The entire carcass (the bones of which he collected on the spot, and the tusks he afterwards procured) is about nine feet high and fourteen feet long, English measure, from the tip of the nose to the coccyx, without, however, comprehending the two horns, or tusks, each of which is a toise and a half long, and both together weigh four hundred pounds. The head alone weighs four hundred and sixty pounds. Mr. Adams collected from the sand bank more than forty pounds of the bristles which the white bears might have trodden into the wet ground on devouring the flesh. Some of the hair was presented to the Museum of Natural History of Paris, and on examination it was found to consist of three distinct kinds; one of these is stiff black bristles two feet in length; another is thinner bristles of coarse flexible hair, of a reddish brown colour, and the third is a coarse reddish brown wool, which grew among the roots of the long hair; affording, according to Cuvier, an undeniable proof that this animal has belonged to a race of elephants inhabiting a cold region. See an Account of a Journey to the Frozen Seas, and of the Discovery of the Remains of a Mammoth, by Michael Adams of St. Petersburgh, in the 29th volume of *Tilloch's Philosophical Magazine;* and *Cuvier's Essay on the Theory of the Earth, translated by Jameson.*

Mr. Adams was persuaded, from the presence of the coccyx, which finishes the vertebral column, that this animal had a very short and thick tail, like its feet. He also states that its teeth are harder, heavier, and more twisted in a different direction, than the teeth of an elephant; that he has seen some of their tusks, which formed, in their curvature, three fourths of a circle, and one of the length of two toises and a half, two feet thick near the root, and two hundred and eighty pounds weight; that the animal is covered with a very thick hair through the whole body, and has a long mane upon its neck; and he believes, that, although no trunk was found, yet that it had one which was carried off by wild beasts; for it would be inconceivable that it could eat with so small a snout and with such enormous tusks without a proboscis; and he fully believes that it is quite different from that found in Ulster county in this state.

M. Humboldt, in his letters dated Lima, 1802, to C. Delambres, one of the perpetual secretaries of the National Institute, says, "Beside the elephants' teeth which we sent to G. Cuvier, from the land of Santa Fé, one thousand three hundred and fifty toises in height, we have preserved for him others more beautiful: some of the carnivorous elephant, and others of a species a little different from those of Africa, brought from the valley of Timaney, the town of Iborra, and from Chili. Here, then, we have confirmed the existence of that carnivorous monster from the river Ohio, from fifty degrees northern latitude to thirty-five degrees south latitude."

"Near Santa Fé there are found, in the Campo de Gigante, at the height of one thousand three hundred and seventy toises, an immense number of fossil elephants' bones, both of the African species and of the carnivorous kind, discovered near the Ohio. We caused several to be dug up, and have sent some specimens of them to the National Institute. I much doubt whether any of these bones were ever before found at such a great height: since that time I have received two from a place of the Andes, situated about two degrees of latitude from Quito and Chili; so that I can prove the existence and destruction of these gigantic elephants, from the Ohio to the country of the Patagonians." *Philosophical Magazine, vol.* 16.

The discoveries of such enormous remains turned the attention of philosophers to the living elephants, and it has been satisfactorily established, that there are two distinct species of them; whereas before they were considered varieties; the Asiatic, denominated elephas indicus, and the African, termed elephas capensis. The elephas capensis has the front of the head convex and inclined, the tusks larger, and the perpendicular layers of enamel, which, with the softer osseous matter, compose the grinders, exhibiting on the top or worn surface a number of rhomboidal spaces, and which are equally observable in a transverse section of the tooth. The elephas indicus is larger; the front of the skull, instead of being convex, is deeply concave, and the upper part so dilated as to exhibit two pyramidal elevations; and the grinders have the enamel layers disposed in the osseous substance, in distinct transverse parallel lines, instead of rhomboidal compartments. Its height appears to be from ten to fourteen feet, and one of the larger size is generally about sixteen feet long, from the front to the origin of the tail. The circumference of the neck seventeen feet, and of the body, in its most dilated part, about twenty-six feet. The legs are short, and about six feet in circumference; the tail slender, and about six feet long. These are the dimensions of the largest elephants, and exceed those of the ordinary size by nearly one third.

The mammoth of New York, although bearing some general resemblance to the elephant, differs from it in the general figure; in the tusks, formation of the head, prominence and pointedness of the back over the shoulders, its great descent thence to the hips, together with the comparative smallness of the body: there are proofs of greater activity also in the structure of the thigh bones, and the formation of the ribs, which are peculiar, and indicative of greater strength. It also differs in the magnitude of the spines of the back; the proportionate length of the processes from the spine of the scapula; the thickness and strength of all the bones, particularly of the limbs; the teeth, which are of the carnivorous kind; its under jaw, which is distinctly angular, instead of being semicircular, as in the elephant, beside several other striking distinctions. There can be little doubt but that it is, therefore, at least, specifically distinct from the elephant. *Philosophical Magazine, Peale's Account, vol.* 14.

The examination of the Asiatic mammoth has also settled the question as to its identity with the American. They are considered as specifically, if not generically, different.

Blumenbach has termed the Asiatic mammoth elephas primævus, or primogenus, and the American mammoth the elephas Americanus. Cuvier calls it the mastodontus, which name has been adopted by Dr. Barton. In the Memoirs of the National Institute, Cuvier describes the former elephas mammonteus, maxilla obtusiore, lamellis molarium tenuibus rectis; and the latter he characterizes as follows: elephas Americanus, molaribus multi-cuspidibus, lamellis post detritionem quadrilobatis. In his opinion neither of them are the same as the existing elephant, and he considers them as extinct. *Sciences Phys. et Mat. II.*

Mr. Tilesius sent to Dr. Barton of Philadelphia some fine large drawings of the mammoth, described by Adams as found near the mouth of the Lena, whereby he had an excellent opportunity of comparing it with Peale's; and he is of opinion, that although very different from the Ohio animal, yet that there are great and striking affinities. In opposition to Cuvier he believes that the Ohio bones bespeak an animal not generically different from the elephant; that, although in the general form of the molares and the disposition of the vitreous body or enamel upon and through them, the Ohio mammoth differs materially from the extinct as well as the existing elephants of the old world, and there is, in this respect, a much greater affinity between the Asiatic mammoth, and the existing Asiatic elephant, than between either of them and the Ohio, or American, mammoth, yet there are several other characters in which the resemblance is much closer between the Ohio animal and the Asiatic mammoth, than between the latter and the Asiatic elephant; and that one of these characters consists in the great resemblance of the incisores, tusks, or horns. Dr. Barton is further of opinion that the Asiatic mammoth has been discovered in different parts of the United States, and that a branch of the Susquehannah receives its name of Chemung from the incisores of one of these animals. *Port Folio, vol. 4. Barton's Letter to Jefferson.*

Governor Pownall, in a paper published in the Philosophical Magazine, (*vol.* 14.) after having viewed a skeleton of the New-York mammoth, exhibited by Mr. Peale in London, is of opinion that it was a marine animal, from the following circumstances:

1. Its being carnivorous, and its enormous bulk would, therefore, require a supply of animal food from the earth which it could not get, and which could only be found in the abundance of the waters.

2. He thinks there are parts in the debris of the skull which have some comparative resemblance to the whale as to the purpose of breathing under water; that the width of the jaws is similar to that of fish; and that the ribs, more similar to those of fish than to those of terrestrial animals, are, by their construction and position, ordained to resist a more forcible external compression than the atmosphere creates.

3. That the neck is so short that the animal could not reach the ground with its mouth, the line from the withers to the end of the under jaw being about one third of the line from the withers to the ground.

Mr. Peale says, that there are many reasons to suppose that he was of an amphibious nature, and is decidedly of opinion that he lived entirely on flesh or fish.

I fancy that while some may be willing to concur with Mr. Peale as to its amphibious nature, few will agree with Pownall in its being an aquatic animal. The shortness of its neck might have been supplied by a trunk. The points wherein it resembles in its formation certain fish, are only indicative of amazing strength; and there is no strong objection to believe that it was also graminivorous, and drew its supplies from the vegetable as well as the animal kingdom.

Upon the whole we may, with considerable confidence, come to the following conclusions:

1. That the Asiatic and African living elephants and Siberian mammoth are specifically distinct.

2. That the New-York, Ohio, or American mammoth is specifically, if not generically, different from them.

3. That it was carnivorous, and lived upon the land.

4. That it may have also been graminivorous or omnivorous, and amphibious.

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5. That it was not of a larger size than the living elephant: and, lastly, that it is extinct. And let not this latter assertion be deemed incompatible with the designs of the Deity. Individuals perish, and why not species and genera? The dispensations of providence are above the reach of human sagacity: much less can we object the fanciful system of the Arabian metaphysicians, adopted by Pope in his Essay on Man, and exhibited in the following beautiful lines:

> "See, through this air, this ocean, and this earth,
> All matter quick, and bursting into birth.
> Above, how high, progressive life may go!
> Around, how wide! how deep extend below!
> Vast chain of being! which from God began,
> Natures ethereal, human, angel, man.
> Beast, bird, fish, insect, what no eye can see,
> No glass can reach; from infinite to thee—
> From thee to nothing. On superior powers
> Were we to press, inferior might on ours;
> Or in the full creation leave a void,
> Where, one step broken, the great scale's destroy'd.
> From nature's chain, whatever link you strike,
> Tenth, or ten thousandth, breaks the chain alike."

This doctrine of a chain of being is equally a superstition of philosophy and a dream of poetry. Many links have been broken in this imaginary chain: many species have been destroyed, and yet the harmony of nature has not been disturbed. The indefatigable Cuvier has classed the fossil remains of seventy-eight different quadrupeds, of which forty-nine are distinct species hitherto unknown to naturalists.

Since writing the above I have received the following well-written and ingenious letter from a gentleman who was present when the skeleton mounted in Peale's Museum was discovered, and whose knowledge of the subject and the surrounding country has given such an interest to the communication that I have thought fit to insert it at large.

DEAR SIR,

IN the Introductory Discourse delivered by you to the "Literary and Philosophical Society of New York" I was present, and highly gratified at the organization of that society. It is gratifying to perceive institutions of this nature, having for their object useful information, springing up at a period of national peril and pressure. The acquisitions of science, in such times, and the devotedness to research, under such circumstances, are unerring evidences of the advancement of learning in our country.

The sources of information in our own state, as well as those of the country generally, afforded peculiar gratification to your delighted auditory. Amongst other objects and discoveries of importance, the remarks on the fossil bones of the mammoth discovered in our state particularly attracted my attention. Conceiving that a further development of this discovery might be interesting, and that the facts concerning it may be proper, I have ventured to address you this letter.

If the disclosures I shall make, and the opinions I may suggest, can be of use to you, they are very much at your service. Should they be of no other use, they may indicate to the more acute observer, where are occult objects worthy of philosophical scrutiny and investigation.

Having participated in the procuring of those fossils, and professing to be well acquainted with their discovery, as also the topography of the circumjacent country, I shall proceed to give you a plain detail of the facts in relation thereto.

The first discovery of these fossils was made in the town of Montgomery, in the county of Orange, about thirty years since, by the Reverend Mr. Annin. The place of discovery was in a sunken and miry meadow, in digging a ditch to carry off the excess of water; several of the harder parts or bones of the mammoth skeleton were discovered; these were the ribs, two teeth, (grinders,) and part of the thigh bone; the teeth and ribs were in a very sound state, but the others were considerably decayed, and an exposure to the air had such an effect upon them, as to render their preservation useless. Subsequent to that time several scattered remains of skeletons of the same animal have been discovered; but from carelessness, or other causes, these have been lost. The speculations of persons who saw these phenomena were various, and, in some instances, ridiculous, affording no rational improvement to the naturalist. The advancement in agriculture, which began to show itself in the counties of Orange and Ulster at this period, while it enriched the husbandman, and beautified the country, was the cause of other discoveries of this nature, which drew the subject before the public, attracted the immediate attention of literary men, and led to the exertions of the enterprising Mr. Peale of Philadelphia, who procured two skeletons of these *non-descript* animals nearly entire; by the ingenuity and enterprise of this gentleman, these hidden treasures of natural history were brought to public view, to astonish and delight the sons of science. At the time of this discovery it was my lot to be in the vicinity, and to contribute my exertions in taking them from their hidden depositories. The parts of these fossils heretofore discovered had excited an interest far short of their importance. The numbers being now increased, and a spirit of inquiry being set on foot, excited a high degree of public interest. *The big bones* (as they were called) were exposed for show, and persons, from various motives, in great numbers, flocked to behold this heretofore hidden wonder. Having had an agency in prosecuting this inquiry, and of bringing the fossils to light, I wrote to Dr. Mitchill a short account of their magnitude, the place of their discovery, the nature of the earth, &c. &c. which that gentleman, with his learned co-editors of the Medical Repository, thought worthy of a place in that excellent register of discoveries and of science. By a reference to that document the magnitude of the particular parts of the skeleton will be found. It is, however, unnecessary to insert it here, as you have other sources of information, which will lead to a more accurate and general result.

The nature and formation of this mammoth country, as well as the particular places where those animals were found, may possibly be interesting; and to this object I shall devote a few general remarks.

The only fossils of this skeleton which have been discovered, have been found in wet and miry lands, in the towns of Montgomery and Shawangunk. The former in Orange, and the latter in Ulster county, in this state: distance about eighty miles from this city, and from six to twelve miles from Newburgh, on the Hudson river.

In a western direction from the Hudson river, for some five or six miles, the ground rises gradually, but perceptibly, until you come to the confines of Coldenham; the waters running easterly until you arrive here, now take the contrary direction, and, turning westerly, are disembogued into a considerable stream, known by the name of *Wallkill*, and sometimes the *Palts River*. On the highlands at Coldenham you perceive a range of high mountains, known by the name of "Shawangunk Mountains," from whence the waters run easterly, and falling into the Wallkill, are carried into the Hudson river, at the strand, near Kingston, in Ulster county, about one hundred and twelve miles distant from New-York.

These mountains on the west, and a ridge of highlands on the east, form a natural valley, of very considerable extent, varying in breadth from thirty-five in the southern, to the northern extremity of three miles, or thereabout. The formation and nature of this country has nothing to characterize it from other parts of our state in the middle district: the woods and forest trees, the grasses, and productions of every kind, are those which are indigenous to various parts of the state, and to all adjacent counties.

The general formation of this country is smooth, marked by some hills of secondary altitude, is susceptible of yielding every kind of produce cultivated in northern climates. The immense quantities of what is generally termed Goshen butter, is made in this valley, and on the lands between it and the Hudson river, extending from New Cornwall, situate at the northern entrance into the Highlands, to the point of land called the *Danse Kamer*, in the town of Marlborough. In all this district of country the pasturage is luxuriant and excellent, and affords a greedy repast for black cattle, sheep, &c. Whether the high flavour of the butter made in this vicinity is owing to the *peculiar* qualities of the pasturage, or to the *particular* manner of making it, is a matter of doubt.

The growing of hemp at the southwestern part of Orange county, has, of late years, been a favourite and profitable pursuit with the proprietors of a large tract of land heretofore covered with an extensive sheet of stagnant water, known by the name of *The Drowned Lands*. This has, of late years, been partly drained by commissioners authorized by law to open aqueducts at the outlet into the Wallkill. Their enterprise has been reasonably successful, and the general opinion of the best informed men seems to be, that their labours will be ultimately crowned with success. In this event a tract of between twenty and thirty thousand acres of land will yield to the proprietors a rich reward for their agricultural labours.

It will be seen from this succinct account of the country, that whether the mammoth delighted in the fertile plain, in the low and sunken meadow, or swamp, or in the lofty and craggy mountains, or in all of them, the variety of the soil and formation of the country, afford a gratification to all his natural inclinations and propensities.

I do not, however, know that the marl discovered in abundance in Ulster and Orange counties, has been found in their neighbourhood; and it is proper to remark, that in these sunken receptacles of vegetable and testaceous solutions, have uniformly been found the bones of the mammoth. Perhaps it may be said, that in this marl, by its alkaline qualities, has the preservation of these fossils alone been preserved from dissolution and decay. The formation of these has evidently been the work of ages. In many places the body of this manure is thirty feet in depth, over which grass and vegetable plants, common to such grounds, grew in abundance, interspersed with trees of different kinds. In these places are uniformly found living springs, and abundance of snail and muscles, which, with vegetable substances, constitute the marl of different colours and (in some respects) qualities.

It may not be improper here to add a few remarks on the subject of this natural manure, which sooner or later cannot fail to be a source of wealth to the agriculturalist. The use of it has heretofore been superseded by the introduction of gypsum, on account of the cheapness of the latter; but interruptions of commerce have already very considerably enhanced the value of this article, and the distance of transportation of that discovered in the western parts of the state, must necessarily put it at a price much higher than usual to our farmers.

The marl here discovered is constituted principally of the solutions of small shells of the muscle and of the snail families; it is mixed with a proportionate quantity of vegetable substances, such as leaves, roots, &c. which find their way by the winds into the waters of these swampy, wet places: these sink to the bottom of the water, and the snails and muscles deposite their ova upon them, and the returning spring, by its genial warmth and natural process, brings them forth. They grow for the season, and in the autumn again deposite their ova upon the fragments of vegetables, which find their way into these watery habitations. I do not know what the theory of conchologist may be, as to the procreation of these shellfish, nor am I at all versed in this kind of natural history; but taking the facts as I have witnessed them, I feel authorized to give this as a theory resulting from actual and personal observation. If a better can be offered by others, I am contented; but, until then, I trust it may be insisted that this is a reasonable explanation of the formation of marl. By this theory it will be perceived that the quantities of marl are continually increasing, a fact of great importance to the inhabitants and owners of the soil. It may be proper to mention, also, that this marl lies in different places in the vicinity of the depositories of these bones, and that as yet, little use has been made of it as a manure; the high price of labour has hitherto prevented the farmer from having recourse to this source of wealth, while he could enrich his lands so much more readily and cheaply by the use of plaster of Paris, or gypsum, as before explained. Within a circle, the *radius* of which does not exceed six miles, there are several hundred acres of marl; a very small proportion of this has been explored or dug to the bottom, where the fossil bones have uniformly been discovered. By the force of their own weight, they have naturally sunk through the soft marl, and found rest many feet below, on solid or harder ground. And yet within the periphery of this circle, *nine* skeletons of these prodigious animals have been discovered! It may certainly be safely computed, that not one hundredth part has been explored to the bottom. If, then, so many have been found in so small a proportion of this *mammoth* ground; and admitting that there has been great *good fortune* in falling upon their place of rest, does it not afford a most reasonable hypothesis to say, that there are vast numbers of these natural curiosities deposited here for future discoveries, and that at some period our country (in this district) was fully inhabited by this stupendous animal.

My reflections on these subjects may appear chimerical and visionary; but a full knowledge of the facts I relate, careful and candid reflections, under all the circumstances accompanying these phenomena, have led me to a firm and unalterable opinion, that these animals were once common in this country; that in numbers, they equalled the other beasts of the forest; such as the bear, the wolf, the panther, &c. &c. In the proportion which larger animals bear to the smaller, in the order of nature. Should my opinion be reasonable, and founded in fact, it leads the mind to a variety of astonishing and curious results.

Why, in the dispensations of an overruling providence, should these animals once have been created, and existed in vast numbers, now be extinct? Or, at all events, expelled from any known region in our country? This becomes a question still more interesting if we suppose the animals to have been carnivorous. That they were so, as well as graminivorous, is pretty well authenticated, by the formation of their grinders. Perhaps, to say they were *omnivorous*, would not be hazarding too much. Indeed, my worthy and learned friend, Dr. James G. Graham, who examined the fossils, went still further; for the formation of the bones, near, and belonging to the foot, warranted him, as a professional man, in the belief that this animal had claws.

I am aware, that an opinion so singular as this, entertained by my learned friend, Dr. Graham, forms an anomaly in nature; but from a careful examination of the bones of the foot, the metatarsal bones (as they are termed in anatomy) were so constituted, that the Doctor drew his conclusions of their appertaining to a *clawfooted* race of beasts. Nor is this opinion more strange than their actual existence. For, whether they are of a genus of animals now unknown—whether of the elephantine family—of the Asiatic or Siberian species, the solution of their existence, upon any certain knowledge, is equally difficult and inexplicable.

From this narrative, you will be enabled to possess yourself of some information on an interesting subject, which could not be well or accurately obtained, except by viewing the topography of the country, and witnessing the taking out of the skeletons; this not being practicable for you in your various literary and official pursuits, I have thought a circumstantial narrative worthy of your enlightened consideration.

This subject has been a source of conversation and inquiry amongst men of information, and has led to different speculative opinions. My friend, the erudite Dr. Mitchill, appears to have struck upon a philosophical explanation, which is at once bold, and will explain the phenomena. By his reflections he places these curiosities amongst *elephantine relics*, occasioned by the change of the axis of the globe ninety degrees, at some very remote period. By this hypothesis may be explained the existence of these bones and bodies of animals, belonging to low and warm latitudes, being found in the cold and frozen climates of the earth. That gentleman supposes the ancient equator to have extended, in the northern hemisphere, from the bay of Bengal, near where the mouths of the Ganges

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are through Thibet, Tartary, and Siberia, to the present North Pole, and thence along in North America through the tracts west of Hudson's Bay and Lake Superior, to the sources of the Mississippi, and thence down to the Gulf of Mexico, near its places of disemboguement, and so onward across New Spain to the South Sea. That such was probably the old equatorial line.

In corroboration of this gentleman's opinion, he truly alleges, that under the ancient equator have been found the remains of animals peculiar to warm climates; the bones of the elephant and the rhinoceros are discovered almost all the way where he would designate the ancient equator; that in colder latitudes the frozen bodies themselves on the banks of the Genessee and the Lena, and in masses of ice lying upon the shores of the Asiatic continent, and thereabouts, have attracted the attention of the naturalist; that in America, the valley of the Mississippi was the place of the former equator, in which direction the fossil skeletons are most frequent, and that the creatures to whom they belong, may be supposed to have perished at the grand catastrophe in their proper and natural climates; that the migration of the human race, and the passage of animals from Asia to America, find a solution by this theory, of easy and rational comprehension.

Dr. Mitchill descants largely and philosophically upon the causes of this change; but as these remarks would be too voluminous to insert here, I shall forbear to enlarge further on a subject involving so many considerations necessary in the examination of the causes and effects producing such vast geological phenomena.

This hypothesis of Dr. Mitchill will easily and readily explain the phenomena of these, as well as of others found in our northern and some southern regions. And if we can admit that these skeletons are nothing more than elephantine relics, of a well known, or even an unknown species, the difficulties now presenting themselves disappear. For my own part, I have reasoned myself into a different opinion; but, after all, the fact must remain encompassed with so many doubts and difficulties, as to perplex the learned and curious.

It is important also to add, that with the discoveries of these skeletons, have been found considerable locks and tufts of *hair*: having been buried a great length of time in a calcarious substance, it retained its natural appearance, and was brought to light in a tolerable state of perfection; the length was from one and a half to two inches and a half, of a dunnish brown colour. In one instance, the hair was much longer, measuring from four to seven inches in length, of the same colour, and resembling, in appearance, the shorter, and was conjectured to have been the mane of the mammoth. Whether a discoloration had not taken place, from its native appearance, must remain a matter of conjecture. In every instance, an exposure to air caused it to moulder away into a kind of impalpable dust. This fact would seem to render it certain, that the animal, the relics of whose body were here found, appertained to a race totally different from any elephants now known to naturalists.

Having thus detailed to you the information, as far as is practicable, in the form of a letter, permit me to congratulate you on the prospect which is opening for scientific research in our state. Much has been done to elevate the character of our beloved country; but it is certainly not saying too much, to observe, that the field of enterprise and research, yet unexplored, is widely expanded, and requires the unremitted attention of profoundly learned men, further to develop the occult treasure of natural history. Under your auspices, and the learned gentlemen associated with you, I trust public expectation will be fully realized, from the discoveries of "the Literary and Philosophical Society of New-York."

Permit me, in concluding this letter, to renew to you the considerations of my best esteem, with a wish, that the friendly intercourse which has so long and sincerely existed between us, may continue until separated by that event which awaits us all.

Your very obedient and humble servant,

SILVANUS MILLER.

The Honourable De Witt Clinton,
President of the Literary and Philosophical Society of New-York.
New-York, October, 1814.

NOTE O.

The white, brown, or grizzly bear, is of all colours, from a brown to almost a perfect white. It is much taller and longer than the common bear; the belly is more lank. It runs much swifter, and its claws, tusks, and head, are much larger and longer, and it has a large tuft on the back of its neck. One was shot on Lewis and Clarke's expedition, which weighed between five and six hundred pounds at least, and measured eight feet seven inches and a half from the nose to the extremity of the hind feet; five feet ten inches round the breast; three feet eleven inches round the neck; one foot eleven inches round the middle of the fore leg; and his talons, five on each foot, were four inches and three-eighths. Its talons are much longer and more blunt than those of the common bear; its tail shorter; its hair longer, finer, and more abundant; its liver, lungs, and heart, much larger, even in proportion to its size; the heart particularly, being equal to that of a large ox; its maw ten times larger; its testicles pendent from the belly, and in separate pouches, from two to four inches asunder; whereas those of the black bear are situated back, between the thighs, like a dog's; its track in the mud or sand has been seen sometimes eleven inches long, and seven and a quarter wide, exclusive of the talons. It is principally carnivorous, and will generally attack a man wherever it sees him. These animals are numerous, and their tenacity of life is wonderful. No wound except through the head or heart, is mortal; and they have even escaped after being shot in several places through the body. The Indians never attack him but in parties of six or eight persons, and even then are often defeated with the loss of one or more of the party; and when they go in quest of him, paint themselves, and perform all the superstitious rites customary when they make war on a neighbouring nation. The Indians say these bears have killed a number of their bravest men. On Lewis and Clarke's expedition, they frequently attacked the hunters, and Captain Lewis himself was chased by one of them, and escaped only by plunging into a river. One of Lewis and Clarke's men shot one of them through the lungs; it nevertheless pursued him furiously half a mile, and he was only relieved from his danger by Captain Lewis and seven men, who followed the bear by his blood a mile, and killed him: he had, with his talons, prepared himself a bed in the earth, two feet deep and five feet long, and was perfectly alive when they found him, which was at least two hours after he received the wound. (*Transactions of American Philosophical Society, vol. 6. Gass's Journal. Lewis and Clarke's Expedition up the Missouri, vol.* 1.) Dixon, the Indian trader, told a friend of mine, that this animal had been seen fourteen feet long, and that notwithstanding its ferocity, it has been sometimes domesticated, and that an Indian belonging to a tribe on the head waters of the Mississippi, had one in this reclaimed state, which he sportively directed to go into a canoe belonging to another tribe of Indians then about returning from a visit: the bear obeyed, and was struck by an Indian; being considered one of the family, this was deemed an insult, was resented accordingly, and produced a war between these nations. The Reverend John Hechewelder states, that the Mohican Indians had a tradition of an animal called the big naked bear. They say that the last was seen on the east side of Hudson's river, where two Indians killed him, after great difficulty; that it was remarkably long bodied, and larger than the common bear; all over naked, except a spot of hair on its back, of a white colour; that it was very destructive to their nation, killing and devouring them. And such was the terror it inspired, that they often say to their children, when crying, "Hush, the naked bear will hear you, be upon you, and devour you." This account agrees, in general, with the grizzly bear, and particularly in the dimensions of the animal, its appetite for human flesh, and its terrific character. There is nothing in our climate which forbids this hypothesis. (*American Philosophical Transactions, vol.* 4.) It was a long time supposed, that this animal was the ursus arctos of Linnæus, and he is so characterized in the 6th volume of the Philosophical Transactions before referred to. I am sorry to say, that such is the low state of natural knowledge among us, that Dr. Belknap, the inestimable historian of New Hampshire, has even represented our common bear as the ursus arctos. (*Vol.* 3.) Bossu, in his travels in Louisiana, says, they have "white bears, whose skin is very fine and soft." (*Vol.* 1.) Forster, the learned translator, says, in a note, "This cannot be the great polar bear, as this latter is only to be met with in the most frigid parts of our globe, and the soft hair, here mentioned, will not admit to think of the polar bear, whose hair is like bristles." Notwithstanding this significant intimation, they have been generally confounded together. Whether this animal is a native of Europe and Asia, I cannot distinctly say; but from the descriptions of Pennant, (*Arctic Zoölogy, vol.* 3.) I should suppose that it is. He says, that there are land bears in the north of Tartary, entirely white, and of a very great size, and that the grizzly bears (which are called by the Germans *silber bar*, or the *silver bear*, from the mixture of white hairs) are found in Europe, and in the northern parts of North America, as high as latitude seventy, where a hill is called after them, Grizzly Bear Hill.

Upon the whole, we may, with propriety, say, that the *bear proper* consists of four distinct species:

1. The polar bear.
2. The grizzly bear.
3. The common bear of Europe.
4. The common bear of America, which is also said to be of two kinds, or, in all probability, mere varieties.

I lay no great stress upon the surmise that the grizzly bear and Mr. Jefferson's *great claw*, are the same animal. They agree pretty well in the dimensions and character of the claw, and in the general size; but the correctness of the hypothesis must be determined by a comparison of the bones.

NOTE P.

ALTHOUGH Buffon seems to have, at one time, adopted this opinion, yet he afterwards retracted it. In one place (*vol.* 3. p. 456.) he says, "the domestic ox, which ought not to be confounded with the urus, the buffalo, or the bison, seems to be a native of our temperate climates; excessive heat, or excessive cold, being equally hurtful to him. Besides, *this species*, so abundant over all Europe, is not found in the equinoctial regions," &c. In another place, after a long chain of ingenious and learned deduction, he arrives at this conclusion: "Thus the wild and domestic ox of Europe, Asia, Africa, and America, the bonasus, the aurochs, the bison, and the zebu, are animals of the *same species*, which, according to the differences of climate, of food, and of treatment, have undergone the various changes above described." (*Vol.* 6. p. 188.) Pennant is equally decided: "The bison and aurochs of Europe is certainly the same species with the American ox. The difference consists in the former being less shaggy, and the hair being neither so soft nor so woolly, nor the hind parts so weak. Both European and American kinds scent of musk. In ancient times they were found in different parts of the old world, but went under different names; the bonasus of Aristotle, the urus of Cæsar, the bos ferus of Strabo, the bison of Pliny, and the biston of Oppian, so called from its being found among the Bistones, a people of Thrace. According to these authorities, it was found in their days in Media, and in Pæonia, a province of Macedonia; among the Alps, and in the great Hercynian forest, which extended from Germany even into Sarmatia. In later days a white species was a native of the Scottish mountains; it is now extinct in its savage state; but the offspring, sufficiently wild, is still to be seen in the parks of Drumlanrig, in Scotland, and of Chillingham castle, in Northumberland.

In these times it is found in very few places in a state of nature: it is, as far as we know, an inhabitant, at present only of the forests of Lithuania and among the Carpathian mountains within the extent of the great Hercynian wood, its ancient haunts, and in Asia, among the vast mountains of Caucasus. *Arctic Zoölogy, vol.* 3.

According to these opinions, the Linnæan name of our buffalo, or American wild ox, is bos bison, or bos bonasus; and that of the Indian buffalo, is bos bubalus. The latter originated in Egypt and India, and is very numerous in all the warm climates of the old world, especially in marshy countries, and in the neighbourhood of rivers. Water and a moist soil seem to be still more necessary to them than the warmth of climate. It was transported and naturalized in Italy about the end of the seventh century, and is now in France. It is used for drawing, and is directed and restrained by means of a ring passed through its nose. Two buffaloes yoked, or rather chained, to a carriage, draw as much as four strong horses, as they carry their neck and head low, and the whole weight of their body is employed in drawing, and their mass much surpasses that of a labouring horse. They are used for ploughing throughout Italy, are hideous animals, with very coarse black hair, and have a singular swinging motion of the head, in walking. The milk is not so good as that of the common cow, but is much more plentiful. A kind of cheese is made of it called firmaggio di cavallo, or horse cheese, but nevertheless very good. Its flesh is not so good, but it is larger and stronger than the common ox. *Buffon, vol.* 6. *Smith's Sketch of a Tour, &c. vol.* 2. The bos bubalus is an entire distinct species from the American buffalo; the period of its gestation is twelve months; whereas that of the American bison and domestic cow is nine. It will have no connexion with them; whereas they breed together. If the climate of this state is not sufficiently warm for this useful animal, it will, no doubt, flourish in the southern states.

The young of our buffalo, or bison, have been repeatedly put among the tame cattle at Quebec, and, after exhibiting, on all occasions, symptoms of their original wildness, have commonly died in a few years. It is supposed that the climate is there too cold for them. This difficulty cannot exist here. Before the cultivation of the country they were in immense herds in the western parts of the state, frequenting the salt licks, and roving over the wide-spreading, luxuriant prairies of the Genessee, and they have given their name to a celebrated stream which runs into Lake Erie near its outlet. It has been domesticated in South Carolina, but appears to retain some of its primitive wildness.

Van der Donk informs us that the buffalo was frequently found in the southern part of New Netherland, and that there are some individuals who domesticate it for their amusement, and being accustomed from its youth to associate with man, it will become remarkably tame, and not readily return to the forest. The male does not depreciate by castration, nor do male or female degenerate by associating with tame cattle; but, on the contrary, both are improved. It is believed that crossing the buffalo with the cow will produce a breed of increased value for the yoke, for the dairy, and for the market; the buffalo, even in its wild state, being naturally strong, yielding excellent milk, and inclined to fatten.

He proceeds to state that there are deer, both bucks and does, of a pure white colour, and that the Mohawk Indians have told him that very far in the heart of their country, there existed large beasts of the form, and above the size, of a horse, whose hoofs were divided, and whose forehead was ornamented with a single horn, of about the length of twelve or eighteen inches, whose swiftness in running, and strength, were so great, that they were taken with the greatest difficulty. "I have never," says he, "seen this animal; but that it does exist I do not doubt for a moment; for the Indians universally affirm it, and the Christians declare they have seen, in the market, hides with but one horn."

If this account is not fabulous, this was probably the elk seen after he had shed his horns, and when the young ones were sprouting; but if not, then a race of unknown animals must have, in former times, existed in this state, which is now extinct.

It seems, then, that there are three kinds of the animal denominated *bos*, all susceptible of domestication, and all highly useful to man.

1. The bos Indicus or bubalus, or Asiatic and African buffalo.
2. The bos bison, or American buffalo.
3. The bos taurus, or domestic ox. The two last, probably, varieties of the same species, and, at all events, specifically distinct from the first.

NOTE Q.

PENNANT, Forster, Buffon, and indeed all the European naturalists, are positive, that our moose is the elk. "The name, says Pennant, is derived from musu, which, in the Algonquin language, signifies that animal. The English used to call it the black moose, to distinguish it from the stag, which they named the gray moose. The French call it orignal." On comparing the animals called moose and elk, *in this country*, we find, at once, a specific difference in their size, their colour, their horns, and their residence, and a great difference in every other respect, except their being of the genus cervus. We are then certain, that the moose is not the animal denominated by us, the elk; but the question still remains open, whether the moose is not the elk, or cervus alces, of Europe, described by Linnæus as having palmate horns, with short or no beams, and caruncalate throat. They certainly assimilate in many respects.

Another question still remains for decision; whether the animal, which we call the elk, is the elk of Europe. I think there can be no hesitation in saying, that it is not. Charlevoix says, that the Canadian stag is precisely the same as that of France, and Buffon says, that it is only a variety of the European stag, or hart; that it differs from it in length of horn only, and in the direction of the antlers, which is sometimes not straight, as in the common stag, but turned backward, so that the end of each points to the stem of the horns. *Buffon, vol. 4.*

Catesby gives the following account of these animals, which appears to be very judicious and correct. "The moose, or elk, alce maxima Americana nigra, is a native of New England, and the more northern parts of North America, and is rarely seen south of latitude forty, and consequently never in Carolina: he is six feet high, about the size of a middle sized ox. The male has palmated horns, not unlike those of the German elk, but differs in having branched brow antlers. The stag of America resembles the European red deer, in the colour, shape, and form of the horn, though it is a much larger animal, and a stronger make; his horns are not palmated, but round, a pair of which weighs upwards of thirty pounds; they usually accompany buffaloes, with whom they range, in droves, in the upper and remote parts of Carolina, where, as well as in our other colonies, they are improperly called elks. The French, in America, call this beast the Canadian stag. In New England, it is called the gray moose, to distinguish it from the black moose." *Natural History of the Carolinas, vol.* 1.

Pike saw plenty of these animals on the Mississippi, sometimes the distance was four feet between the horns, and one hundred and fifty of them were frequently in a flock. Pennant says, that stags abound in the mountainous southern tract of Siberia, where they grow to a size far superior to what is known in Europe. The height of a grown hind is four feet nine inches and a half, its length, eight feet, that of its head, one foot eight inches and a half. *Arctic Zoölogy, vol.* 3.

Mr. Jefferson, in his notes on Virginia, says, perhaps it will be found that there is,

1. The moose, black and gray, the former being said to be the male, the latter the female.
2. The caribou or renne.
3. The flat horned elk, or orignal.
4. The round horned elk.

The black moose and the third, are the same animal, and the grey moose and the fourth. The moose has large flat palmated horns; our elk has round cylindrical horns. The former is confined to the regions of the north; the latter extends itself from Canada to the south.

The animal called caribou in Canada, is the rein deer, or cervus tarandus, of the old world. Buffon says, that the elk is found only on this side, and the rein deer beyond the polar circle in Europe and Asia. In America, we meet with them in lower latitudes, because there the cold is greater than in Europe. And he says, that this animal formerly existed in the forests of Gaul and Germany; if so, there is no improbability in supposing that he formerly visited us in search of his favourite food, the rein deer moss.

From the chaos which has existed on this subject, we may extricate order and light, and I think we are well warranted in saying,

1. That the animal which we call the elk, is not the cervus alces, but that it is either a variety of the stag, red deer, or hart of Europe, the cervus elaphas, or a distinct species of cervus.
2. That it is not the moose, and that the moose, according to the opinion of the most eminent naturalists, is a variety of the cervus alces.

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And, 3. That besides these two animals, we have the rein deer, or cervus tarandus, of the old world, called with us the caribou.

Buffon says, that the cervus Virginianus, is only a variety of the cervus dama, the common or fallow deer of Europe.

Have we any other species of cervi ?

Have we the roe deer, or cervus capreolus? Buffon says it is found throughout all North America.

Have we the red deer, cervus elephas? Jefferson says that it is an American animal, and that it weighs two hundred and seventy-three pounds.

What animal is that called by Lewis and Clark in their Travels, the mule deer ?

A young moose has been lately exhibited at Albany as a show. It is hoped that some of the scientific gentlemen of that city have directed their particular attention to it.

NOTE R.

The able editors of the American Medical and Philosophical Register, knowing my partiality for this distinguished naturalist, requested me to write a review of the five last volumes of his American Ornithology. This request I complied with, although fully sensible of my unfitness for the task. As this review contains a full statement of my view of Mr. Wilson's great work, it may not be improper to insert it in this note.

[From the American Medical and Philosophical Register, vol. 4.]

AMERICAN ORNITHOLOGY; *or the Natural History of the Birds of the United States: illustrated with plates, engraved and coloured from original drawings taken from Nature.* By ALEXANDER WILSON. Philadelphia. Inskeep & Bradford. Imperial 4to vols. 5th, 6th, 7th, 8th, and 9th. About 120 pages each: 1812—14.

The author of the American Ornithology having closed his earthly career before he finished that important work, the task of completing the ninth and last volume, devolved upon his friend and executor, Mr. George Ord, who has prefixed to it an interesting biography of Mr. Wilson. Having, on former occasions, noticed several of the volumes, it now remains for us to pay the last tribute of respect to a man whom we esteem, and to an author whose works will always occupy an important rank among the writings on Natural History.

The life of Mr. Wilson exhibits the complete triumph of genius over the want of education, and of persevering industry over the evils of poverty. Without any other reliance than on his own faculties, and with a force of exertion which nothing could check or retard, he has obtained a celebrity in science to which few men, in this country, can aspire; although many may be more highly favoured with the endowments of genius, and more extensively gifted with the advantages of early education, and the bounties of fortune. The life of Wilson shows, conclusively, that the temple of fame is open to the most humble individual in the community, if he only attempts it with zeal and industry, and with a judicious selection of the part which he intends to act on the theatre of the world: and it may not be amiss to add, in opposition to the complaints of his biographer, that notwithstanding he experienced, in some few instances, the slights of ignorance, and the sneers of impertinence, yet that a liberal and enlightened community bore witness to his merits by a munificent subscription, which, after satisfying all expenses, would have placed him, if living, on the enviable ground of independence.

The science of Ornithology is involved in considerable difficulty and confusion. The arrangement of animals according to the principles of the Linnæan system, is an admirable contrivance to extricate the science of zoölogy from the darkness which surrounded it. The classes and orders of the great naturalist are arbitrary: the genera and species are natural; but when we consider that the general characters of birds are taken from the bill, tongue, nostrils, cere, caruncles, and other naked parts—and that the characters of the species are derived principally from the plumage and habitudes, we must be sensible that here is a wide field for a difference of opinion. Besides, the nomenclature adopted, in endeavouring to compress the descriptions of animals within the shortest compass, is frequently a mystery to most readers. Take, for instance, an account of a bird by Linnæus, Latham, or Pennant, and it will require considerable industry to penetrate the exact meaning of the author. The generic characters frequently run so closely into each other, that it is no easy task to make the appropriate arrangement. The plumage of birds varies according to seasons, to age, and to climate, and their manners assume a different appearance at different times, and in different countries. The sexes exhibit, almost invariably, a diversity. The male is frequently smaller than the female, and is generally arrayed in a more beautiful dress. Genera are confounded together; varieties are represented as distinct species; the male is placed in a different species from his mate, and the same bird, at different ages and seasons, is considered a different species. The names of birds vary in different places.

In the same district of country the same bird frequently goes by different appellations, and the scientific name is also not uniform; Linnæus, Brisson, and Buffon, oftentimes disagree. We may add to this, the absurd custom adopted in this country of naming our birds after those in Europe, to which they are supposed to have some likeness, although, in most respects, they are dissimilar.

There are three modes in which we may obtain a knowledge of birds.—From personal observation of these animals in their natural state—from preserved subjects in cabinets of natural history—and from books. The first is undoubtedly preferable, so far as it goes; but it is necessarily limited by our range of travelling. The second supplies this defect, but it is liable to this great objection; the subjects are often not only imperfectly prepared in the first instance, but generally decay and dissolve. In Cayenne, which has furnished more subjects for the cabinets of European naturalists than any other country, the birds are steeped in spirits for a long time, and dried by the heat of an oven. This must undoubtedly, in many instances, sully the glossy beauty of their plumage, and give them an appearance different from their natural one. Books must be resorted to in order to complete and extend our knowledge; but to place our sole reliance on them would be as absurd as to attempt to attain a knowledge of mankind by the meditations of contemplative retirement.

Our author has, with unparalleled industry, and singular sagacity of observation, surmounted all the disadvantages which we have enumerated, and availed himself of all the sources of information: every state in the union has witnessed his labours: on our Alpine hills—in our most distant forests—on the borders of our rivers and lakes—on the shores of the Atlantic, the footsteps of his enterprising industry may be seen. He first examined the feathered creation with his own eyes—he traced them in their most secluded haunts—he watched their migrations—he observed their seasons of song, and of love, and of incubation—he noticed their food, their instinct, and their habits.

After having explored this source of information, he next had recourse to cabinets of natural history, to the aviaries of amateurs, and to the observations of inquisitive and ingenious men. The museum of Peale furnished him with various and extensive knowledge; the methodical and comprehensive writings of Linnæus; the extensive information of Pennant, Brisson, Edwards, and Latham, and the splendid elucidations of Buffon, were also familiar to him.

Thus furnished with information, he has produced a work which excels all that precedes it, whether we have reference to the style and matter, or the drawings. It is in vain to attempt to form ideas from written descriptions of animals, sufficiently distinct, so as to distinguish them in all cases from each other: we must have recourse to the delineations of the pencil, and to the preservations of the museum. The number of species of birds has undoubtedly been greatly multiplied from the generality and confusion of descriptions: let the same bird be described after the Linnæan manner by two different persons, and it is an equal chance if they do not vary in some essential respects; but a faithful representation of the pencil will at once remove all ambiguity. The delineations of Wilson are done in such a masterly style that the bird is at once recognised. He also excels in his account of the manners of birds; although he cannot boast of the splendid eloquence of Buffon, yet there is such a fascination in his style, such a simplicity in his manner, and so much truth and nature in all his remarks, that we are compelled to give him the preference.

To form a just estimate of the extensiveness of this work, we have only to compare it with the celebrated natural history of Mark Catesby, published in 1754. Although the drawings of this writer are eminently beautiful, and generally correct, yet they are greatly inferior to those of Wilson. His descriptions also will not bear a comparison, either in interest or extent: the whole number of birds which he describes amounts to 113, which contained all the land birds he saw in North America, between the 30th and 45th degrees of latitude. Wilson has figured and described 278 species, 56 of which were not known before: his untimely death has prevented the full execution of his plan. The swan, the turkey, and the crane, the most interesting of the feathered race, did not come under his review, a loss that cannot be supplied. With what interest would we read his remarks on the turkey? What light would he not have cast upon those controverted questions, whether the turkey is of exclusive American origin? and whether the domestic is a distinct species from the wild turkey? and whether, contrary to the general operation of cultivation and domestication upon animals and plants, this bird has dwindled in size, and sustained a deterioration by its domestic state?

Although Wilson has done much, yet much more remains to be done, in order to complete our ornithology. The whole number of species, according to Latham, is three thousand. Considering that the American republic, including our Louisiana acquisition, extends from the Atlantic to the Pacific, embraces the greatest and most spacious inland seas in the world, comprehends every variety of climate and soil, innumerable and boundless forests—prairies, or natural meadows, of several days' journey—deserts like those of Africa—mountains dividing the country into an eastern and western section—and rivers equalled in size by none in the old world: considering also its vicinity to numerous islands of a warm temperature, and the approximation of America to Europe and Asia, by which the land birds of the old world can have easy access to our continent: it is not unreasonable to suppose, that we may claim at least one thousand species of birds, who either reside among us, or occasionally visit us. If this calculation be correct, what an extensive field yet remains for the ornithologist? and if another Wilson shall arise,

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endowed with genius and invincible industry, the rich treasures of natural science, which are now hidden from our view, will be drawn from the darkness which covers them, and exposed to the full view of an admiring world.

NOTE S.

It would occupy too much ground to state the various difficulties which perplex the naturalist in this interesting study. The greatest embarrassment exists with respect to the identity of the species, and this proceeds from the application of the names of European birds to ours which are entirely distinct; from the imperfect, indistinct, and general descriptions of ornithologists; from an inattentive observation of the changes which take place from age, from climate, from season and food, and from the great difference which nature has established between the sexes. It has, until lately, been doubted whether the bald eagle and the sea eagle were the same; and the same difficulty has occurred in relation to the whippoor-will and the night hawk. This is now considered as settled. The latter are supposed to be distinct species, and the former are the same birds under different appearances of plumage.

An interesting discussion has been had upon this question, whether the turkey is exclusively of American origin? Thomas Pennant published, in the Transactions of the Royal Society, a paper to show that the turkey came from America, and was unknown before the discovery of that continent. Daines Barrington, who has taken the opposite side of the question, asserts that this fine bird boasts an eastern origin. According to a distich in Baker's Chronicle, turkeys were introduced into England from Spain. Latham, in his Synopsis of Birds, says, that turkeys were brought into England about 1524, and that they unquestionably came originally from America, and are found largest in the northern parts. Bartram, in his travels through the Carolinas and Floridas, represents "our turkey as a very different species from the meleagris of Asia and Europe; they are nearly thrice their size and weight; they are taller, and have a much longer neck proportionately, and likewise longer legs and stand more erect; they are also very different in colour; they are all of a dark brown colour, not having a black feather on them; but the male is exceedingly splendid with changeable colours." Michaux, in his Travels to the westward of the Alleghany Mountains, &c. says, "To the east of the Mississippi, in a space of more than eight hundred leagues, there is only one species of wild turkey. Some weigh thirty-five or forty pounds. The variety of domestic turkeys to which the

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name of English turkeys is given in France, came originally from this species of wild turkey, and when they are not crossed with the common species, they retain the primitive colour of their plumage as well as that of their legs, which is a deep red. If subsequent to 1525 our domestic turkies were naturalized in Spain, and from thence were introduced into the rest of Europe, it is probable that they were originally from some of the more southern parts of America, where they doubtless exist a species different from that of the United States."

Notwithstanding the authoritative decisions of the two last quoted writers, I think we may venture to dissent from them, and to say that the wild and tame turkeys are only varieties of the same species. It is well known that they breed together, and that their offspring are also productive. The only difficulty, then, is respecting their size and plumage; all animals are changed by domestication. Their colour, in a wild state, is generally uniform and similar, but when tamed, it changes into a number of varieties. The mallard is the stock from whence our domestic duck proceeds, and the gray lag is the origin of the domestic goose. The colour of these birds, in their reclaimed condition, is various; in their wild state it is uniform. The turkey when domesticated is exposed to the same mutations. As to comparative size, it may be observed, that the largest wild turkey does not exceed the largest tame turkey one half in weight; and this may also proceed from domestication. If the bison is the original stock of our tame cattle, has not the latter diminished in magnitude by the change? But this diversity may, perhaps, be satisfactorily accounted for in another way. The turkey was introduced into Europe from Spain, and Spain derived it from her tropical colonies. It is a bird which flourishes best in temperate climates; as it extended its migrations too far to the south, it diminished in size: although the identity of species could not be changed, yet a variety was produced of inferior magnitude. From the Spanish turkey, which was thus spread over Europe, we have obtained our domestic one. The wild turkey has been frequently tamed, and his offspring is of a larger size.

Considerable doubts have also been suggested with respect to that interesting bird called the rice bird, reed bird, or bob lincoln, (emberiza oryzivora.) I call it interesting on account of the beauty of its plumage, the melody of its notes, and the delicacy of its flesh, which induced Brisson to call it l'ortolan de la Caroline. Its migrations have been represented as composed of each sex distinctly. Catesby first suggested this idea. "In September," says he, "when the rice birds arrive in Carolina, in infinite swarms, to devour the rice, they are all hens, not being accompanied with any cock. Observing them to be all feathered alike, I imagined they were young of both sexes not perfected in their colours; but by opening some scores prepared for the spit, I found them to be all

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females; and that I might leave no room for doubt, repeated the search often on many of them, but could never find a cock at that time of the year. Early in the spring both cocks and hens make a transient visit together, at which time I made the like search as before, and both sexes were plainly distinguishable. In September, 1725, lying upon the deck of a sloop in a bay at Andros' Island, I, and the company with me, heard three nights successively flights of these birds, (their note being plainly distinguishable from others,) passing over our heads northerly, which is their direct way from Cuba to Carolina; from which I conceive, after partaking of the earlier crop of rice at Cuba, they travel over sea to Carolina for the same intent, the rice there being at that time fit for them." *Natural History of Carolina, Florida, and the Bahama Islands, vol.* 1.

Bartram seems to have adopted the same opinion, but with some hesitation. "It is (says he) the commonly received opinion, that they are male and female of the same species, i. e. the black-pied rice birds the male, and a yellowish clay-coloured one the female; the last mentioned appearing only in autumn, when the oryza zizania are about ripening; yet, in my opinion, there are some strong circumstances which seem to operate against such a conjecture, though generally believed."

About the middle of May, the black-pied rice bird, called the male, appears in Pennsylvania, about which time the great yellow ephemera, called May fly, and a species of locustæ, appear in great numbers, the favourite food of these birds. *Travels in South Carolina, vol.* 1.

Dr. Barton states, that the rice bird makes its appearance near Philadelphia, about the 20th of May, and that the females exclusively make their appearance about the 20th of August. "On the authority of Catesby," says he, "it has been believed by the most respectable naturalists, (Pennant and others,) that the males and females migrate separately at different seasons. Thus it is imagined, that the males make their appearance in the vicinity of Philadelphia in the spring, and the females in the autumn, or close of summer. Some facts which have come under my knowledge, induce me to suspect, that this is a vulgar error; one of the many mistakes with which natural history is crowded and deformed, but at present I can only throw out the suspicion." *Fragments of Natural History.*

Although these supposed separate several migrations may be considered anomalous, yet they are not without precedent. The male cuckoo arrives in England before the female. The male of the motacilla luscinia, or nightingale, arrives there about a week after the female. The male of the sylva sylvicola, or wood wren, precedes the female in its vernal migrations to that country, a week or ten days. And what is still more extraordinary is, that we have the authority of Linnæus for saying, that the female chaf-

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finches of Sweden, (fringilla cælebs,) migrate only, and this assertion is confirmed from seeing only females of that species, in certain parts of England, at that time. And to show an instance of a peculiar exception from a general rule, we have only to advert to the arrival of some birds into Great Britain against a strong wind.

We all know that the notion of the arrival of the different sexes of this bird, at different times, in this part of the country, is unfounded. They arrive on Long Island sometime in May, and have their young in June, when the distinction of sexes in the young, as well as old, is obvious, the young males resembling the old ones; and they are, at that season, brought alive to our markets, by the bird catchers, for sale, and sold to be kept in cages. They retire from us the latter end of the summer, at the same time; but the positive assertion of Catesby, and others, that females are only seen in Carolina in September, and that he had verified this opinion by dissection, was calculated to produce acquiescence, until Wilson cleared up this subject. He says, that they arrive in Pennsylvania from the 12th to the 20th of May, when they go to the north; that from June till August, the male changes his colour, and assimilates the female, when they retire to the south; that the organs of birds, by which the sex is detected, are, in autumn, no larger than the smallest pin's head, and that the spring increases them a hundred fold, which led to the error of Catesby, when he applied the anatomical knife. (*Wilson's Ornithology, vol. 2.*) That in October they visit Jamaica and Cuba, and return to the continent early in the spring. This is a most satisfactory solution of all the doubts which have existed on this subject. When Dr. Barton states, that the females exclusively make their appearance in Philadelphia, about the 20th of August, the male bird has then changed its colour, and both sexes are on their southern journey. When Catesby and Bartram say, that the females only appear in autumn in Carolina, it is only a continuation of the southern progress of both sexes identified in external appearance. When Catesby made his dissections, and concluded that all his subjects were females, it was in September, when the sexual distinctions are not palpable; but when they became so in the spring, he had no difficulty in recognising both male and female.

I might extend these remarks, on similar topics of inquiry, but I have already occupied too much ground: these slight sketches will indicate what an interesting and spacious field of investigation might be explored.

NOTE T.

In 1810 I saw a great number of ravens on the borders of the beautiful Lake Canadesaga, or Seneca, near the village of Geneva, and was told that no crows had made their appearance in that part of the country. Michaux, in his travels before quoted, observes, that the crows have not yet been seen in Tenessee; but it is probable that their appearance is only deferred, for they are already very destructive in Kentucky. The gray rats of Europe in like manner follow the establishments of the whites; they have not yet penetrated into Cumberland in Tenessee; they make their appearance a few years after the country has been inhabited.

NOTE U.

The lepus Americanus described by Linnæus evidently means our wild rabbit. It cannot apply to the northern hare, which is evidently larger than it.

Dr. Belknap denominates our hare the lepus timidus, or common hare, and our rabbit the lepus cuniculus, or common rabbit of Europe. He is mistaken in both appellations. The common hare does not exist in this country, nor, it is believed, in any part of America, although Linnæus says that it inhabits Europe, Asia, and America. We certainly have no animal corresponding with it. Nor does our hare resemble the lepus variabilis, as described by Linnæus. He says that it inhabits the northern hills of Europe, Asia, and America, migrates in troops in winter into the plains, and returns in spring to the mountains; that it is easily tamed, is playful, and fond of honey. This does not, in any respect, apply to our hare, nor does his description of its colour and changes apply. Our hare is the most wild and indocile of animals. I had several of them caught alive at Albany, with a view of letting them loose for propagation in the thick, impenetrable swamps of Long Island; but such was their wildness that of twenty or thirty procured for that purpose, they either pined away, or killed themselves by beating against their cages, and I therefore could not succeed in my plan. They were entirely white, and their flesh is excellent.

Kalm describes our wild rabbit as a hare, and as much smaller than the Swedish hare, and but little bigger than that of the rabbit of Europe. (*Kalm's Travels, vol.* 1.) He further says, that the hare at Hudson's Bay, and in Canada, (the hare of which I speak,) perfectly corresponds with the Swedish hare, being in summer of a brownish gray colour, and in winter of a snowy white. Mr. Pennant says, that the varying hare weighs only six pounds and a half, the common hare upwards of eight pounds, and the American hare, or our wild rabbit, from three pounds eight ounces to four pounds and a half; and he says that the first is met with in Canada and Newfoundland, after which the species ceases to the southward, or at least he has no authority for its being continued; the hare of New England seeming, by Josselyn's account, to be the American hare or wild rabbit, that it inhabits Greenland, and is found about the rocks at Churchill, and the straits of Hudson's Bay, but that it is not common. We must, therefore, succumb to these great authorities, and acknowledge that our hare is, at least, a variety of the lepus variabilis of Europe. So far, however, from being confined to Canada, as is represented, it is in great numbers about Albany, and has been seen near forty miles to the south of that place, on the east side of the Hudson. Its food is said to be grass, white moss, and the bark of the birch-tree, of which it is very fond; it does not burrow in the ground, but harbours in hollow trees. Dr. Williams, in his History of Vermont, says, that a large hare weighs eight pounds, and the largest rabbit seven pounds. Hearne saw the varying hare as far north as latitude seventy-two, and says it sometimes weighs fourteen or fifteen pounds.

As connected with this subject it may not be amiss to observe, that it is not probable that either our hare or rabbit can be domesticated. The common rabbit of Europe, however, would flourish here, and its skin alone would render it an object to have warrens made for its habitation. Its amazing fecundity is well known. It lives to the age of eight or nine years, and is capable of procreating at five or six months. The female is gravid thirty or thirty-one days, and she will bear seven times annually, and produce five young at each time. Supposing this to happen during the space of four years, and that three of the young at each producing are females, the increase will be 478,062. This exceeds the fecundity of the pigeon, which, according to Pliny, may produce, from one pair, 14,760 in four years. Until of late years the gray rabbit was the only species in the English warrens; at present the silver-haired rabbit is sought after, and has, within the few last years, supplanted the other, because the skin is dressed as a fur, and sells for more. (*Daniel's Rural Sports*, *vol.* 1.) It is believed that the tame rabbit which has been brought into this country in a domestic state, is not the proper rabbit for stocking warrens. It is not a little surprising that this easy source of profit has been entirely overlooked with us.

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NOTE V.

Homer, who has been closely imitated by all the celebrated epic poets, has thus described the migration of cranes:

> So when inclement winters vex the plain
> With piercing frost, or thick descending rain;
> To warmer seas the cranes embodied fly,
> With noise and order, through the midway sky:
> To pigmy nations wounds and death they bring,
> And all the war descends upon the wing.
>
> POPE'S TRANSLATION.

Virgil thus describes the same subject:

> ——— Quales sub nubibus atris,
> Strymoniæ dant signa grues, atque æthera tranant
> Cum sonitu, fugiuntque notos clamore secundo.
>
> ÆNEID, Lib. 10.

On comparing these descriptions, of the four greatest epic poets who have adorned the world, can there be any hesitation in awarding the palm of superiority to Milton?

The anus canadensis, or wild goose, when formed into a phalanx for migration, appears in the shape of a wedge.

Although the ancients were so much puzzled about the migration of birds, that they supposed it extended to the moon, yet it is now no longer a mystery. The departure of the swallow has been a subject of more speculation and fable than that of any other bird. The estimable Bartram told Dr. Barton, that he has seen, in the autumn, large flocks of all our four species of swallows, on their return southward from Pennsylvania, through Carolina, Florida, &c. and in the spring on their return to the northward again. *Fragments of the Natural History, &c.*

Catesby supposes, that birds of passage, particularly swallows, pass to the same latitude in the southern hemisphere, as the northern latitude from whence they came; that they retire, for instance, from Carolina to Brazil, and particularly, that our chimney swallow corresponds with the description of Margravius' andorinha, which he considers a full confirmation of his hypothesis. The European swallows probably retire to Africa. Adanson, when within fifty leagues of Senegal, caught, from the shrouds of the vessel, four European swallows. This was on the 2d of October, 1749, and they were then retiring from the approach of winter to Senegal, in the torrid zone, where they are never seen but at this season of the year, along with wagtails, kites, quails, and other birds of passage, and they only spend the winter, without building nests, or producing young. Our chimney swallow is not known in Europe. And our hirundo rustica is not precisely like that of Europe; it disagrees particularly in the colour of the breast, which, in the latter, is white, like that of our bank swallow, whereas ours is ferruginous. Kalm says, that they nearly correspond in colour, but that there appears a small difference in the note; they are, probably, varieties of the same species. Dr. Barton thinks that our bank martin, or land swallow, is not the hirundo riparia of Linnæus. Kalm, in his voyage to this country, saw, on the first of September, about one thousand miles from our coast, some land birds flying about the ship, which he took for sand martins, (hirundo riparia;) sometimes they settled on the ship, or on the sails; they were of a grayish brown colour on their back, their breast white, and the tail somewhat furcated. They were driven away by a heavy shower of rain. On the next day a swallow fluttered about the ship, and sometimes settled on the mast, and several times it approached the cabin windows, as if willing to take shelter there. Eight days afterward, within the American Gulf, an owl and a little bird settled on the sails. On the 12th of September, a woodpecker of a speckled gray colour on the back, extremely fatigued, and another land bird, of the passerine class, endeavoured to rest on the ship. Kalm's destination was Philadelphia, (where he arrived on the 26th of September,) and from the 25th of August, to the beginning of September, the swallows retire from that part of the country. If those seen by Kalm were not driven by storms from their course, they evidently intended to take up their winter residence beyond sea. Catesby says, that on his voyage from England to Carolina, (where he arrived on the 23d of May, 1722,) in the latitude of twenty-six degrees north, about midway between the two continents of Africa and America, which he says cannot be less than six hundred leagues, an owl appeared hovering over the ship, and after some attempts to rest flew off; this was on the 22d of March: on that day a hawk with a white head, breast, and belly, appeared in like manner, and the day after some swallows, but none ventured to alight on any part of the ship. This was about the time of year when swallows return from their winter migrations, and those were, probably, returning to Carolina. Kalm met them going to Africa in the fall, when they leave us, and Catesby met them returning in the spring, when they join us.

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Our spring and summer birds of passage continue with us about six months, and are absent about that time. They avail themselves of high and favourable winds, to depart and return. A strong south or southwest wind, about the beginning of April, says Bartram, never fails of bringing millions of small birds of passage, who appear very suddenly in spring; and when the pewit or phebe, (muscicapa fusca,) the first bird of passage which appears in Philadelphia, in the spring, which is generally about the first or middle of March, arrives, then pease, beans, and almost every kind of esculent garden seeds may be planted without danger of frost.

Bartram distinguishes birds as follows:

1. Those that arrive in Pennsylvania in the spring, from the south, and return in autumn, after building nests and rearing young.
2. Those that arrive there from the north, in autumn, where they continue during the winter, and return again in spring, and these birds continue their journey as far south as Florida.
3. Those that arrive in Carolina and Florida, in the spring, from the south, and breed, and return in autumn without going further north.
4. Natives of Carolina and Florida, where they breed and continue all the year.
5. The same of Pennsylvania.

NOTE W.

The Rev. Dr. Miller, in his excellent work, entitled A Retrospect of the Eighteenth Century, states, that there are two thousand five hundred and thirty-six species of birds. Latham, in the first six volumes of his Synopsis of Birds, has described ninety-six genera, and two thousand and forty-six species. The additions made in his subsequent volumes have increased the number of species to three thousand.

The number of birds treated by Linnæus did not greatly exceed nine hundred.

There are in Great Britain three hundred and seven species of birds, comprehending all such as either visit that island at uncertain seasons, or are usually domesticated, as well as those which are known to be constant inhabitants, of which one hundred and fifty-four are land birds, and one hundred and fifty-three water birds.

I think it is not unreasonable to suppose that there are, in the United States and its territories, one thousand species of birds.

NOTE X.

I BELIEVE it may be laid down as a general rule that all birds of the anas genus may be domesticated. That beautiful bird, the summer or wood duck, (anas sponsa,) and the black duck, (anas obscura, or nigra,) I have seen in a state of domestication. Mr. Cornelius Bergen, of King's county, about the latter end of April, put fifteen eggs of the black duck, on which the old one was sitting, under a dunghill hen; the next day twelve young were hatched, of which he raised eleven; one of them flew away in August, and returned in November, with a strange male, which was taken and tamed. It mixes readily with the common duck, and their offspring are productive. It lays a great many eggs, and has two broods in a year. Latham says, that the American wigeon, (anas Americana,) or pheasant duck, as it is called at New-York, has been domesticated; its flesh is most excellent.

Lewis and Clarke saw, on the Missouri, a small species of goose differing considerably from the Canadian goose, and beautiful white brants, which, no doubt, might be domesticated.

Scudder has, in his museum, two specimens of non-descript geese, shot on Long Island, and never seen before. One he calls the brant goose, and supposes it to be a hybrid, produced by the Canada goose and the brant; the other is of a dark cinerous colour, and is rather smaller than the wild goose.

The anas cygnoides orientalis, or Muscovy gander, breeds with the common goose; and the anas Ægyptiaca, about the size of the common goose, is a beautiful bird; they are common in gentlemen's ponds in England, and might be introduced into this country.

A variety of the anas boschas, or common duck, with a hooked bill, is kept in Germany, almost to the exclusion of the common sort. The French, or gray duck, is much larger than the common.

The swan is domesticated in Europe, and has been brought here. Neither this bird nor the wild goose will breed, unless measures are taken to accommodate them with appropriate places for that purpose. Islets ought to be made in their ponds, surrounded with high grass, in order that they may be allured to make their nests, and where they may sit without disturbance.

Dr. Barton says, that the Indians of Carolina had domesticated a large bird of the family of the grallæ, or waders, and no doubt several birds of this genus might be reclaimed from their wild state, and rendered useful.

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The hoco goes by different names: it is called curasso in Brazil, and in Surinam it is called the powesa, and peacock pheasant; it is about the size of a common turkey; is a beautiful bird; the flesh is excellent; it is the crax alector of Linnæus. Scudder has a beautiful specimen in his museum. It is sold at Paramariebo for more than a guinea a-piece, and it ought to be naturalized here.

The Peruvian hen, or crax rubra, has been introduced into England. The flesh is white, and esteemed good. The climate of that country is supposed not to be warm enough for it, as the toes are apt to rot off. Beside these, there are in Guiana and Brazil, a new species of dunghill hens from the interior, the yacon of Cayenne, which is larger than a fowl, and breeds in a domestic state, the dindon, or meleagris cristata of Linnæus, which inhabits Brazil, where it is tamed, and the flesh is much liked; the parraka of Buffon, and hannaquam of Bancroft, the size of a small fowl, its flesh good, and it is in a domestic state; and also le marail of Buffon, and marrodee of Bancroft, about the dimensions of a fowl. I am not certain but that some of these are the same bird under a different name. If our climate is too cold for them, they may answer in the southern states.

It may also be considered a general rule that all birds of the Columba genus may be domesticated. Our poultry may, in this respect, be greatly improved, not only in variety, but in size.

The great crowned Indian pigeon (Columba coronata) has been brought to Europe alive from the East Indies, where it is kept as domestic poultry. It is as large as a turkey.

In Java, Celebes, and Ceylon, there are eighteen or twenty species of wood pigeons, some of which are as large as a small hen.

We have no pheasant in this country. Governor Wentworth, of New Hampshire, brought several pairs of pheasants from England, and let them fly in his woods at Wolfborough, but they have not since been seen. It is the phasianus Colchicus of Linnæus, is the size of a fowl, and produces cross breeds with hens; this production is supposed to be the origin of the game cock. It appears from Hartlib's Legacy that in 1650 these birds were kept tame in great numbers, and he mentions a lady who raised two hundred one spring.

The China pheasant (phasianus pictus) is a hardy, beautiful bird, and might be easily naturalized: it breeds with common pheasants. Scudder has a bird of this kind, and the golden pheasant of the same country, in his museum. The golden pheasant, and a pheasant called the ring pheasant, a variety of the common one, have been found at large in England.

The Padua cock and hen weigh from eight to ten pound, and is a variety of the phasianus gallus, or dunghill cock.

The phasianus gallus exists in a wild state on some of the moors in the northern counties of Scotland; the eggs are nearly double the size of ordinary eggs.

A variety of the tame kind has two toes behind, instead of one; of a large breed one has weighed fourteen pounds. Another frizzled variety has the feathers curled up; the flesh is firm and delicate; it is a tender kind, brought originally from the East Indies. The Turkish cocks and hens are said to differ from ours in the variety and beauty of their colours.

Clavigero says, that there are two kinds of pheasants in Mexico, of the size of a goose, with a crest on their heads, which they can raise and depress at pleasure, that they are distinguishable by their colour, and some particular qualities. The first is called the royal pheasant, or coxolitti, and has a tawny coloured plumage, and its flesh is more delicate than that of the other. The latter is named tipetotohl, and will sometimes pick from his master's hand, meet him with signs of joy, shut the door with his bill, and fight like a cock in poultry yards; his feathers are of a shining black, and his legs and feet ash-coloured.

The tetrao francolinus of Linnæus is as large as the common partridge, it inhabits the warmer parts of Europe; it may be kept in aviaries where it breeds freely.

The tetrao rufus greak, or great red partridge, is larger than the common one.

The red legged partridge, or tetrao rufus, has been let loose in its wild state in England; they are all over Europe, Asia, and Africa, and are so tame in the Isle of Scio, according to Tournefort, that they may be driven to seek their food in the fields like so many sheep.

The tetrao perdrix, the common partridge of Europe, is not larger than our quail, (tetrao marilandus;) with a little encouragement they have been made as tame as common poultry; they will not breed in a state of confinement; but if the eggs are placed under a hen, she will hatch them and rear the young as her own chickens. Willoughby says, that a certain Sussex man had, by his industry, made a covey of partridges so tame, that he drove them before him upon a wagon, upon a wager, out of that county to London, though they were absolutely free, and had their wings grown.

The common quail (tetrao coturnix) is a migrating bird, spread all over the old world, is seen from the Cape of Good Hope to Iceland; comes north in spring and departs south in autumn. It is about the size of our robin, and is not in this country.

The gold-breasted trumpeter (psophia crepitans) inhabits various parts of South America, is near the size of a turkey; its flesh is as good as that of a pheasant; it is called agame by the French, and cani-cami in Surinam; it is most easily tamed and a great

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friend to man, whom it follows, caresses, and even seems to protect, with the attachment of a dog; it is reared for domestic uses, and fed among other poultry.

The jabiru, or crane of Surinam, is larger than a stork; its head and primary feathers of the wing and tail, are black; it lives entirely on fish, and is domesticated in poultry yards.

I have thus enumerated between thirty and forty species of birds, most of which may be kept as domestic poultry, and all of them may be made ornamental or useful. Indeed, we have the authority of scripture to a much greater extent. St. James says, "Every kind of beasts, and of birds, and of serpents, and things in the sea, is tamed and hath been tamed of mankind."

It is hoped that these hints may have a tendency to attract the public attention to this useful branch of domestic economy.

NOTE Y.

The Fish-Market of New-York may be considered as the general deposite of every eatable, and every curious inhabitant, of the waters. Every thing that gratifies the appetite for food or for novelty, centres here.

Notwithstanding this, it is an extraordinary fact, that until Dr. Mitchill commenced his investigations, there was not a good catalogue of our fishes; and it is well known, that New-York is very seldom mentioned in the books of ichthyology.

That distinguished gentleman commenced his labours in November, 1813; and he began at the very elements. Every sort of fish was procured, examined, and described. The specimen and the description were next compared with those in the best books; he frequently dissected the individuals which he had described, in order to make himself acquainted with the internal marks and characters, and sometimes he satisfied himself experimentally on their qualities as food.

He also availed himself of various ichthyological assistance, and more especially of the General Zoölogy of Shaw, the General History of Fishes by Bloch, and the Museum Ichthyologicum of Gronovius.

The classification has been attended, in several respects, with difficulty. He has adopted the five orders of *apodal*, *jugular*, *thoracic*, *abdominal*, and *cartilaginous*; but in some cases there were doubts about the genus, and in some instances about the species. There is reason to suppose, that many of the species are non-descripts. The whole which the Doctor has examined and described amount to more than one hundred and fifty species and varieties. And in addition to this, he has made great progress in describing the cete, or whales; the testacea, and crustacea, forming the shell fish; and the mollusca, constituting the soft, boneless, and gelatinous class of animals. Dr. Mitchill's account of the *codfishes* of New-York may be seen in the Amer. Med. and Philos. Register, vol. 4.

If the whole world contains one thousand species of fish, as is said, it is not unreasonable to suppose, that the United States and their dependencies contain between three and four hundred. Our western lakes furnish a great number; and as our waters are discharged into every ocean that surrounds America, there can be no hesitation in assenting to the reasonableness of this estimate. The work of the Doctor is now ready for publication. It ought to be accompanied by engravings, taken from correct drawings; and as the expense of such an undertaking is enormous, the munificent patrons of science and genius, and our enlightened public bodies, ought to come forward and promote the publication of a work so interesting, undertaken and executed by one who has done as much for the honour of American science and literature as any man living.

As connected generally with this subject I am happy to have it in my power to furnish a literary curiosity. It is a poetical version, by Dr. Mitchill, of the third Piscatory Eclogue of Sannazarius, who is thus characterized by Dr. Blair: "Sannazarius, a famous Latin poet, in the age of Leo X. attempted a bold innovation. He composed piscatory eclogues, changing the scene from woods to the sea, and from the life of shepherds to that of fishermen. But the innovation was so unhappy that he has gained no followers. For the life of fishermen is, obviously, much more hard and toilsome than that of shepherds, and presents to the fancy much less agreeable images. Flocks, and trees, and flowers, are objects of greater beauty, and more generally relished by men, than fishes and marine productions." This may be true to a certain extent; but it does not follow that a description of the simplicity, activity, and variety of piscatory life, has not its charms and attractions, as well as a delineation of the tranquillity and composure of the pastoral state. It is well known that those who devote themselves to the sports of the waters, and the active pursuits of the fisherman and seaman, cannot be induced to change their destination; and surely poetical representations, calculated to recall to the memory scenes of such delight, and to awaken the mind to their contemplation, are worthy of the best efforts of genius, and deserving of the highest encomiums of taste and just criticism. Sannazarius wrote five eclogues. The third now published is called Mopsus, and has a considerable resemblance to Virgil's Palæmon. It is a conversation in which four speakers take their part. Their names are Celadon, Mopsus, Chromis, and Iolas. The

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contending fishermen extol the charms of their mistresses, Chloris and Nisa, as the most lovely and excellent of their sex. At last Mopsus decides that both have acquitted themselves well, and rewards one with a speckled shell, and the other with a branch of coral.

The third Piscatory Eclogue of Sannazarius.

MOPSUS.

CELADON, MOPSUS, CHROMIS, IOLAS.

CELADON.

COME, tell me, Mopsus, (since, as Ægon says,
The storm at Bauli kept you fourteen days,)
How you, and Chromis, and Iolas, fared,
While all his rage the furious south prepared.
Did you, while he insulted sea and waves,
Find any pastime in your dreary caves?

MOPSUS.

What could our muses, Celadon, perform,
Listless and torpid, midst the roaring storm?
While conchs untouched escaped our searching hands,
And crabs eight footed safely kept the sands.
Our boat was lodged in safety high ashore,
Our nets extended hung from oar to oar;
Beneath our feet the hooks and baskets lay,
And rods, and seines, and weirs obstruct our way.

Then Chromis fine Inarime surveyed;
"From you our skiff came hither," grieved he said;
"(Ah, hapless exile,) while our sovereign's cause
His youthful bands beyond the ocean draws.
One war despatched, another soon begins,
And lands remote the king victorious wins.

He thunders where Liguria's rocks abound,
And where the peaked Stœchades are found.
Beyond the Rhodanus our legions shone,
(I think Amilcon said it was the Rhone,)
Beheld the strand where ocean swells his tide,
And banks from which blue Britons were descried;
Who, when the water ebbs, (if fame speak true,)
Catch fish in plenty left exposed to view."

"Renew not now my woes," Iolas cried;
"But put, Oh Chromis, this discourse aside;
For Lycabas alarm sufficient gave,
When late we paddled on the Lucrine wave.
In farthest climes he saw the setting sun,
Beyond the waves and clouds his journey run;
Just as from our Cajeta he descends,
And far beyond the land his circuit ends;
No noise is heard as down his chariot bends.
The people's different modes he understood;
Their oaken houses and their huts of wood;
Their cities, places, names, and tribes he knew;
The Bellovacians, and Morinoes too,
And rough Tarbellians;—words pronounced with pain,—
How rivers wandered through a breadth of plain;
How some new Loire he sailed with covered prow;—
But other cares demand attention now.
Do thou, since love of Chloris warms thy veins,
Ascend this rock and alternate my strains;
Mopsus will hear, and succouring our need,
Pour forth the music of his slender reed.
"They said, and I agreed; without command
My sounding pipe I quickly took in hand;
And as by turns the swains their silence broke,
I furnished music to the words they spoke;
Nor more delay, his voice blythe Chromis tried,
And quick responding Iolas replied."

CHROMIS.

Ye Nereids, holy maids of Ocean! bear
Gifts from your floods to please my cruel fair;
Or, if she slight them, search the deeps around
Till for my desperate love a cure be found.

IOLAS.

Ye sirens, powers revered! attend my prayer;
Let Nisa own me, and her slights forbear;
Or see me die;—beneath the rolling wave
Midst rocks and sea-wrack I shall find a grave.

CHROMIS.

As wherries on the level surface glide,
When breathing zephyrs gently curl the tide,
And on their seats the rowers careless lie;—
When Chloris loved me, just so calm was I.

IOLAS.

Behold the rocks when angry billows sweep
And from the bottom raise the troubled deep;
The rocks are moved, the earth with trembling groans;-
Is this the picture of my Nisa's frowns?

CHROMIS.

Oh Proteus, shepherd of the sea, Oh sire,
Oh king, attend a love-sick swain's desire;
Go thou to distant Pithecuse, and there
To Hyale the proud, at once declare,
To tend my sea-born monsters is *thy* care.

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IOLAS.

Yon rock, that stands not far from shore, shall prove
A firm memorial of my steadfast love;
Swim to it, Glaucus, and to Nisa say,
Lest from my hardened hands she turn away,
That *thou* to land dost haul my scaly prey.

CHROMIS.

Cyprus to Venus, Crete to Jove, is dear;
To Juno Samos, Vulcan Lemnos, near;
But while Ænaria shall my mistress suit,
Samos and Lemnos fall to disrepute.

IOLAS.

Mars Rhodope, Phœbe Ortygia, loves,
Mercury Cyllene, Pallas Hymettus' groves;
But while Prochytes is my darling's spot,
Hymettus and Ortygia sink to nought.

CHROMIS.

Here caves, and rocks, and withs for nets, abound,
And rush and myrtle cluster thick around;
Was Phyllis present, or was Chloris by,
How well could I the raging winds defy!

IOLAS.

Without my Nisa nothing seems to please,
The lands are sad, and comfortless the seas;
I hate my hooks and nets; with her before
To fish were charming, even on Lybia's shore.

CHROMIS.

Sinussa mackrel, soles Dinarchus deals,
Herculia mullets, and Amalphi eels;
With blooming girls Parthenope is gay;—
Who now shall bid me search elsewhere for prey?

IOLAS.

Gudgeon in rivers, dragonet in weeds,
Squid 'midst the rocks, in open water feeds
The lamprey; I my Nisa's threshold court;
What happier island has so good a port?

MOPSUS.

Thus I remember how the rocks among
With various strife they safe and shelter'd sung;
And praise and presents earn'd, befitting those
To whom his commendation Triton shows;
One gets the shell I div'd from Circe's ground,
With specks and purple beautified around;
The other gains a coral in its pride,
With knobs and branches well diversified.

NOTE Z.

THIS is the general opinion at Albany, and is alluded to by Dr. Mitchill, in a letter to the Reverend Dr. Miller, (*Collections of the New-York Historical Society, vol. 1.*) where he says, "It is reported that the course of the herrings was more especially on the west side of the river." This fish is not of the same species which abounds at particular seasons in the European seas, as Dr. Mitchill has satisfactorily shown. The European herring not only differs in its appearance, but in its manners; it never, like ours, deposites its spawn in the waters of fresh rivers. Catesby seems to have given currency to

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this mistake, in saying, that all the sea and river fish that he observed in Carolina, differ from those in Europe of the same kind, except pikes, eels, and *herrings*. Kalm, who was well acquainted with this fish, on the other hand asserts, that what are called herrings in New-York, differ greatly from the European herrings. General Lincoln, in a very interesting letter to Dr. Belknap, (*History of New Hampshire, vol.* 3.) has successfully shown, that the river fish never forsake the waters in which they are spawned, unless some unnatural obstructions are thrown in their way; that when obstructed, they do not seek new sources in which they may lodge their spawn, but that they are so strongly allured to the same route, that they annually return to their natural river, pressing constantly for a passage into their mother pond; that the quiet waters of the lake can alone give that nourishment and protection necessary to the existence of the egg, the preservation of which is indispensable if an extinction of the schull is to be prevented. I have no doubt, therefore, but that the mode in which our herrings ascended the river, is truly stated. The Sebastacook which falls into the Kennebec, is supported by numerous streams which abound with the small river fish, such as alewives, &c. and the inhabitants of that country say, that at the time of the running of these fish, they ascend the streams at distinct periods in succession, and that the schulls never separate, interfere, or transgress in their way to their respective ponds or lakes. The great spawning rendezvous of our herrings, were the cool wholesome waters of the Saratoga Lake. At the proper season the lake was filled with them, and they afforded abundant supplies to all the surrounding country; its outlet fish creek was obstructed by mill-dams, which prevented the ascent of the fish. The consequences have been not only to exclude it from the upper waters, but to create a most serious diminution in the waters below. If it had not been for this obstruction, we would have had not only a sufficiency for our home supply, but a valuable article for exportation. The state at large is interested in removing these barriers against the ascent of the fish. Let the mill-seats be purchased, the mill-dams demolished, and the communication be completely opened; and let herrings, at the time of spawning, be conveyed alive to the Saratoga Lake; their offspring will, in due time, descend to the ocean, and inevitably return. At the first settlement of the town of Hugham, in Massachusetts, the alewives were in such plenty as to give a full supply to the inhabitants, which was destroyed by the erection of the mill-dams, that prevented their ascent to a pond. The people attempted, after a great lapse of time, the reëstablishment of them, in which they succeeded by opening proper fishways through the mill-dams, and conveying the fish in the spring of the year, in a proper vehicle, into the pond; this was done by keeping it near the bank of the river, and frequently shifting the water in the vessel. After this, the fish increased annually until there was a pretty good supply, but as there were many

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shoal places in the river which required very constant attention, the expense of which, and the loss sustained by stopping the mills, exceeded, in the opinion of the town, the advantages of the fish; the business was neglected, so that for a number of years they have been entirely cut off from the pond. Notwithstanding, some of the fish annually return to the mouth of the river, urging a passage up, but they are decreased in number and reduced in size.

Dr. Barton has very justly observed, that "There is a vast chasm in the History of the Fish; a chasm, too, in relation to which I have always deemed the most interesting part of animal natural history, I mean the instincts, or manners, or habits of animals. How little do we know of the instincts of the fishes! Forgetting that the element in which they live precludes us from acquiring an easy or a rapid acquaintance with the *mores* of the fishes, and not sufficiently modest to acknowledge their own incurious supineness, the best naturalists have fallen into the error, that fishes are a stupid race of beings; that they discover very little of ingenuity; and that they are in a great measure strangers to that *storge*, or powerful affection, by which animals are so generally attached to their young. I venture to assert, that very much of what has been said on these subjects, is mere declamation, unsanctioned by enlarged observation or experience. My own inquiries have convinced me that we have detruded the fishes to too low a station in the scale of animal intelligence and of storgal love." *Discourse on Desiderata in Natural History.*

Dogs have been trained for hunting and fowling. The falcon has been taught for a similar purpose; and the cormorant has been rendered useful in catching fishes. But I believe, it is not generally known, that the Indians of the Antilles, had the art of taming a species of sea fish, and employing them to chase other larger fish. Of this art, Oviedo Gomara, and other writers, make mention.

The species of fish which those Indians trained to chase large fish, as they train hawks in Europe to chase other birds, was rather small, called by them, guaican, and by the Spaniards, reverso. Oviedo explains the manner in which they made use of this fish to chase others. *Clavigero's Mexico, vol. 2.*

After this, we certainly can have no hesitation in believing, that the same fishes return periodically to the waters of their nativity for breeding, and pursue a prescribed, undeviating course.

NOTE A A.

Some are of opinion that in the upper lakes there are salt-water fishes which have been left there since the retreat of the waters after the general deluge, and that they cannot return to the ocean on account of the cataract of Niagara. A captain of a vessel, who was well acquainted with the navigation of those lakes, assured me, that he could, in the spring and fall, when the floods are high, go with his vessel, drawing six feet water, from Black Rock in Lake Erie, to Lake Michigan, from thence up the Chicaga creek, to its then junction with the Illinois river, thence down that river to the Mississippi, thence to the Gulf of Mexico, and that then, of course, he could come round to New-York. The sea-fish could easily proceed in this route; if not, some of them might leap down the falls and effect their escape.

There is certainly, however, a very great resemblance between the fishes of Lake Erie and the fishes of the Atlantic.

1. The *white fish;* a most delicate fish, and superior to the shad in flavour. Its head and mouth are like those of our shad, and so is the fish generally.

2. *Herring;* thicker through the body, and nearly the same length as that on the sea coast. It resembles the Nova Scotia herring.

3. *Sheep's head;* like ours, but no teeth; a hard, dry fish.

4. *Basse;* is a Dutch word, signifying perch. *Black, or Oswego, basse,* a fine fish, like our black fish.

5. *Rock basse;* like the sea basse.

6. *White basse;* in shape like our white perch, but rather longer. The tail resembles that of the rock fish, and its sides are striped.

7. Sturgeon; is the largest fish in the lake. It has no dorsal fin. In respect to shape, it is similar to that in the Hudson, and has the same habit of vaulting.

Sturgeon have been caught in Lake Ontario weighing one hundred pounds.

8. Sun fish.

9. Musquenonges, or pickerel; a fine fish; it has been caught forty-five pounds in weight.

10. Pike.

11. Very large snapping turtles.

12. Muscles.

13. Cray fish; a species is found in all our small streams exactly like the European; but they have greatly diminished.

14. A species of clams.

15. Sword, or gar, fish.

This catalogue is very imperfect; for there are, beside these, a number of other kinds.

Salmon have been caught, in the Seneca river, in every month of the year. They sometimes weigh thirty-seven pounds. They pass Oswego, and go up the Oswego river in April, are then in fine order, and spread over all the western waters in that direction, and return to Lake Ontario in September and October, much reduced in size and fatness. If this fish has the same habits as the European salmon, the numerous conical collections of gravel which are to be found near the margin of several of the western rivers, must have been erected by them. In England they deposite their spawn in holes made purposely in beds of gravel, and covered with successive layers of the same materials, and as it becomes animated each individual liberates and provides for itself. Their growth is singularly rapid, arriving at six or eight inches in length early in spring, at which season the whole become immensely numerous, follow the old fish by descending with floods to the sea.

Although there is no animal, if we except man himself, that is so universally disseminated over every climate and country in the globe, as the common eel, being an inhabitant in almost every instance where fresh water flows or is permanently stationary, yet, strange as it may appear, I am told that none are to be seen above the cataract of Niagara, or in Lake Erie. The eels migrate every autumn to the sea, for the purpose of propagation, and the young ones return up the streams in spring and summer, in immense numbers. Some stay in fresh water all the year; but they do not breed; and it seems to be a fact well established, that they do never breed in fresh water, the periodical descent of the old ones to the ocean, and ascent of the young ones from thence, prove that the scene of their propagation is in the sea itself. The route by the Mississippi is so long that these periodical journeys are impracticable; and although often seen ascending the rocks forty or fifty feet at the Niagara falls, yet they have been invariably driven back, and have not been able to reach Lake Erie in that direction. The eel is, in one respect, like the shad; the latter does not attempt to ascend the Mississippi; now and then a meager herring is caught at Pittsburgh, which has struggled upwards of two thousand miles against a strong current. If eels were left in Lake Erie after the deluge, they must have become extinct in process of time, from the impracticability of access to the ocean, where alone they can propagate. A remarkable fact, corroborating this opinion, occurred, a few years ago, in the vicinity of this city. The river Passaic is formed by the union of three considerable streams, called Rockaway, Long Pond, and Ramapough creeks. Until a canal was, some years ago, cut round the great falls at Paterson, no eel was ever seen in the waters above. Since that time they abound in those streams, and are among the best in this country, both for size and quality. The elvers, or small eels, are seen every spring and the beginning of every summer, ascending those streams in immense numbers.

The natural history of the eel has always been, and still is, involved in great obscurity. Oppian thus describes the generation of the eel:

> "Not thus conchs, eels, and polypi embrace,
> Nor purple lampreys rear their embryo race
> In selfish coils, hermaphrodite they sit,
> And their own power the vital spume emit.
> Which gradual dropp'd on sands or slimy mud,
> A silver offering render to the flood."
>
> Translated by GOOD, in a note to his LUCRETIUS, vol. 1.

It is not certain whether eels are oviparous, or viviparous. It is confidently asserted that many persons have convinced themselves of the latter, by opening the eel and taking from it a small, soft, whitish substance, knotted curiously together. Upon being put into the water this has separated, and the young eels were perfect, and, although not bigger than a small thread, have swam about; this discovery always took place the end of summer, or beginning of autumn, and has been adduced as evidence of their going down to the salt water to spawn. (*Daniel's Rural Sports, vol. 3.*) On the other hand, it is said, in the Philosophical Magazine, (*vol.* 34.) that they have indeed been generally supposed viviparous; "but the immense abundance of the young certainly bespeaks an oviparous progeny, and this is supported by analogy in the lamprey eel, which breeds commonly enough in most of our estuaries."

NOTE BB.

HUDSON, the day on which he arrived at Sandy Hook, (*September 3d*, 1609.) saw, as he denominates them, "Many salmons, mulletts, and rays, very great;" and when he

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passed through the Highlands on the 14th, he says there were "Great store of salmons in the river."

It is not impossible but that this might have been the case. The Mohawk river formerly contained trout, a species of the genus salmo, but it now has none. Fishes sometimes leave their former haunts and repair to other places where they can find food more agreeable or abundant, and where they deposite their spawn with greater safety. It is now well known, that no salmon are ever seen in the Hudson, except a few estrays who have missed their way into the Connecticut river. Salmon delight in clear, cool, and limpid water, and the Hudson is, particularly at the period of their vernal migration, discoloured and muddy. Since the wood creek which falls into the western lakes has been connected with the Mohawk river, by a canal, the latter has been supplied with a species of dace which has greatly increased; and black basse and a salmon have been taken who penetrated through the canal to the river: It would be a curious circumstance if the Hudson should receive the salmon through this new channel, and a singular voyage for this fish to enter, from the ocean, the Gulf of St. Lawrence, to swim up the river of that name to Lake Ontario, pass up the Onondaga river by Oswego, to the Oneida Lake, ascend Wood Creek to the waters of the Mohawk river, and enter them by the canal, vault down the great falls of the Cohoes, descend the Hudson, and return at the next vernal migration to the St. Lawrence. Independently of the nature of the waters, and the food they furnish, there must be some latent cause for the preference which is given by fishes to certain rivers: Perhaps this may be, in some measure, ascribed to their periodical return to the place of their origin. How shall we account for the salmon being in Connecticut river, and in Merrimack and the rivers lying between, being perfectly destitute of these fish? Dr. Franklin told Kalm, that in that part of New England where his father lived, two rivers fell into the sea, in one of which they caught great numbers of herrings, and in the other, not one; yet the places where the rivers discharged themselves into the sea, were not far asunder. They had observed, that when the herrings came in spring to deposite their spawn, they always swam up the river, where they used to catch them, but never came into the other. The Doctor's father, who was settled between the two rivers, took some in his nets as they were coming up for spawning, took out the spawn, and carefully carried it across the land into the other river. It was hatched, and the consequence was, that every year afterwards they caught more herrings in that river, and this is still the case. This leads one to believe that the fish always spawn in the same place where they were hatched, and from whence they first put out to sea.

I at one time entertained hopes that the Journal of Hudson would have furnished satisfactory evidence on this subject, from the mode of fishing. It appears, that one time on the coast of Nova Scotia, he caught twenty-seven great cods with hook and line, and if the fish he procured in the Hudson were obtained in the same way, it would prove that the salmon was not among them, as this fish is rarely got in any other way than by the spear or net. But it appears that he also used a net. In one place he states, that the men went in his boat on shore to fish, opposite against the ship, but could not find a good place ; this shows that he employed the net. We can, therefore, place no reliance upon this consideration. The migrations of salmon with us, are vernal, and after depositing their spawn, they return to the ocean. It is presumed, that there are no salmon in our eastern rivers, in September ; Hudson must, therefore, have meant some other fish. Linnæus in his Systema Naturæ, has enumerated fifty-six different species of the salmon genus. Hudson certainly did not intend the common salmon. I believe, that the fish he meant, is our rock fish or streaked basse, which comes into the river about that time, in great numbers.

Hudson says, "The river is full of fish ;" "our boat went ashore and caught great store of very good fish." We know that this is not the case, except when the anadromous fishes ascend the river, and that even they have experienced a great diminution. Adrian Van der Donk, M. D. who had resided nine years in this state, when called New Netherland, and who published in the Dutch language, in 1655, a topographical and Natural History of New Netherland, &c. says, that the Hudson, the Mohawk, and all the waters of the country, abound with every kind of fish in their respective seasons, and that in March, 1647, at the time of a great freshet, two whales of considerable bulk, went up the Hudson one hundred and sixty miles ; one of them, however, returned and grounded about forty-eight miles from the sea shore, where four others, that same year, had also stranded and perished ; the other grounded about one hundred and seventy-two miles up. Notwithstanding the inhabitants had obtained a great quantity of train oil from it, yet by reason of the swiftness of the current at that time, the whole river for two or three weeks acquired an oily taste, and exhibited an unctuous appearance, and the noxious effluvia were offensive eight miles off. Here it appears that in one spring, six large whales had ascended the Hudson ; and they were, no doubt, allured in that direction by the multitude of fish. A whale has recently ascended the Delaware as far as the falls at Trenton. The Hudson is now not only a steril river, but all its tributary streams partake of the same defect. Kalm says, that several gentlemen and merchants of New-York, between fifty and sixty years of age, told him in June, 1749, that during their lives they had plainly found several kinds of fish decrease in number every year, and that they could not get near so many fish now as they could formerly. Kalm further says, "At the first settlement, the bays, rivers, and brooks, had such quantities of fish, that at one draught in the morning, they caught as many as a horse was able to carry home. But at present things are greatly altered, and they often work in vain all the night long, with all their fishing tackle. The causes of this decrease of fish, are partly the same with those of the diminution of birds, being of late caught by a greater variety of contrivances, and in different manners than before. The numerous mills on the rivers and brooks, likewise contributed to it in part, for it has been observed here, that the fish go up the river in order to spawn in shallow water, but when they meet with works that prevent their proceeding, they turn back, and never come again." Independently of these causes, we know that fishes change their places of resort in the ocean, probably being frightened away by fishes of prey. "It has never been formerly known," according to the same writer, "that cod-fish were to be caught at Cape Henlopen; they were always caught at the mouth of the Delaware, but at present they are numerous in the former place."

Dr. Belknap says, that the basse was formerly taken in great plenty in the river Pascataqua, but that by the injudicious use of nets in the winter, this fishery was almost destroyed; that the salmon formerly frequented the same river, but that the numerous dams built across its branches, have obstructed the course of this valuable fish, and that it has for many years totally forsaken the river.

At a place called Columbia, on the Seneca river, twelve miles from Three River Point, a rolling dam was made over the river, and a canal of one hundred rods was cut, and two locks made in order to facilitate the navigation, which was greatly impeded, and at sometimes rendered impracticable by two shallow rapids called *M. Harry's and Jack's Rift*, the latter of which extends ten miles above Columbia, and is very shallow and bad, particularly at the upper end. Since these operations, the inhabitants above complain most grievously about the diminution of salmon, which formerly abounded in the Cayuga and Seneca Lakes, and their tributary streams, and they attribute it to the dam. Now it is well known, that a rolling dam particularly, cannot oppose any serious impediment against the ascent of this fish. When the waters are high, several vessels avoid the canal and pass over the dam. It is indeed now understood, that the salient powers ascribed to the salmon, have been greatly overrated; and that it is a vulgar error to suppose, that the salmon coils himself up in the form of a ring, and seizing his tail in his mouth, by the strained violence of an elastic spring overleaps the highest ascents in an aerial somerset. On the contrary, in every instance where he ascends those elevations called salmon leaps, he does it by swimming up and over the face and brow of the water-fall, penetrating through the interior of the descending body of water, by means of his vast muscular power operating on the action of his tail; and he effects his passage when the stream is very much flooded, and a large unbroken mass of water is descending. Without such a solid column of water, his ascent would be physicially impossible; at these times the water, as in all cases of flood, is highly discoloured, and so dartingly quick is the ascent of the fish, as rather to resemble the transient gleam of a passing shadow over the water, than a real substance penetrating through it. (*Philosophical Magazine, vol.* 34.) It is nevertheless obvious, that this dam could not prevent the ascent of salmon: some other cause must be found out. The salmon is a very timid fish. In April, May, and June, 1810, the year after the canal was used, near two hundred boats had passed through it. The improved navigation had greatly increased the number of vessels which used it. The width of the river at the dam is about twenty-three rods. In salt water creeks, where no obstacles exist, the same complaint is made of the scarcity of fish. Newtown creek, which heads about four miles from the east river, by an uninterrupted navigation, is, when compared with its former abundance, now almost destitute of fish. The principal cause of the diminution is, in the augmentation of the number of boats, and the increase of the navigation, which have frightened the fish away.

Other reasons may be assigned of great weight. The cultivation of the country has had a prodigious effect in producing this diminution. Some species of fish subsist on the larva of insects and worms. The cutting down of trees, the drying up of swamps, marshes, the ploughing of land, and the exposure of the soil to the influence of the sun, have lessened these sources of subsistence. The streams and rivers have also been diminished in size, some of them have been entirely dried up. The fountains and springs which furnished cool retreats for the deposite of their spawn, are destroyed. The alluvial deposites have also choked up their ancient places of resort, have discoloured the waters, and rendered them disagreeable and unhealthy; and they have thus been expelled from their former domains, and have been obliged to look out for other haunts, in wild and uncultivated countries.

Having so often referred to Hudson's celebrated voyage up the North, or Hudson, river, it may not be uninteresting to mention the several animal, vegetable, and mineral productions which, he says, that he saw on this voyage.

Salmon; mulletts; rays; breams; basses; barbels; Indian corn; dried currants; venison; pompions; beans; hemp; chesnuts; grapes; tobacco; yellow copper; beavers' skins; otters' skins; oak-trees; walnut-trees; ewe-trees; trees of sweet wood; slate for building; a stone like emery that would cut iron or steel.

And of Indian manufactures, he saw,

Deer skins well dressed; red copper tobacco pipes; pots of earth to dress meats; beads; bows and arrows; dresses composed of mantles of feathers; dresses of skins of divers sorts of good furs; ornaments of copper about the neck.

Van der Donk, before quoted, says, that the Indians plant maize, and different kinds of beans, (which, they state, came to them from the southern Indians,) pompions, and squashes, and that their country abounds with mulberries of a superior quality, a great variety of plumbs, wild cherries, juniper berries, small apples of different kinds, hazle nuts, black currants, gooseberries, blue West-India figs, whortleberries, different kinds of blackberries, and one kind of as excellent a quality as in Holland, barberries, cranberries, artichokes, which grow under ground, aart-aackers, or espea d'Etruffer, (probably truffles,) easter beans, wild onions, and garlic. That in spring and autumn the water fowl are so numerous that the inhabitants in the vicinity of the waters are often deprived of sleep by their noise; that the swan is most numerous; that there are three kinds of geese; that the fishes are in the greatest plenty: streaked basse, shad, sturgeon, sea basse, black fish, herring, &c. and shell-fish of all kinds; that the best oysters are sold from four to six stivers a hundred; that the number of deer is incredible; and that eighty thousand beavers are annually killed in those parts, exclusive of elands, (elks,) bears, otters, and deer, and yet their numbers do not appear to be diminished.

He further says, that when the Indians are disposed to treat you in an extraordinary manner, they serve you with the tail of a beaver, the head of a streaked basse, roasted maize, or chesnuts beaten into flour, boiled with the fattest meat.

NOTE C C.

The appearance of fish in waters which have no communication with other waters has perplexed naturalists. It is extraordinary that perch should have appeared in all the lakes of Ireland, and in the Shannon, at the same time, about forty years ago. If a heron (says *Daniel's Rural Sports, vol* 2.) has devoured the ova of a pike, and afterwards ejected them while feeding in a pond where there were none before, it is highly probable they may be produced from this origin, in the same way as the seeds of plants are known to be disseminated. Gmelin observes, that the duck kind swallow the eggs of fishes, that some of these eggs go down and come out of their bodies unhurt, and so are propagated. Adanson observed, in Africa, several small fishes in morasses formed by rain water, which, by their lively red colour, appeared to be roaches. The water dried up in a day or two, and the fish died. The next year new ones appeared entirely like the preceding. The ponds here had no communication with the Niger, which is about three hundred fathoms off. How did these fishes get there? They were not brought by aquatic birds, because this species of fish is unknown to that river. Have they sprung from the ova of the preceding year; but how did they get there first? Are they drawn from distant waters by the power of evaporation, and conveyed to those ponds? If the facts are truly stated, this is an unaccountable phenomenon.

An occurrence of a somewhat similar nature took place on this island some few years ago. Shortly after the first establishment of the Elgin Botanic Garden it became necessary to obtain a permanent and plentiful supply of water, for the various purposes of that institution, as well as to afford a place of growth for aquatic plants. To this end the proprietor, Dr. Hosack, in a season of uncommon drought, had an artificial pond, of considerable extent, made on a portion of the ground that had hitherto been a mere morass. Upon excavating this morass, to the depth of from six to ten feet, a number of springs were opened, which afforded the necessary supply of soft fresh water. To the astonishment of all, at the ensuing summer, a considerable number of small fish appeared; and since that time this artificial pond, about a mile and a half distant from any waters, has abounded in fish of considerable size: some of them being five, six, and even seven inches in length.

In Lowthorp's Philosophical Transactions, (*vol.* 2.) it is stated, that a pasture field in Kent, containing two acres, and far from fishponds, or the sea, but a scarcity of water, was all overspread with little fishes, conceived to be rained down, there having been, at that time, a great tempest of thunder and rain. The fishes were about the length of a man's little finger; were supposed to be young whitings, and were about a bushel in quantity.

Fishes may be propagated and brought from a distance in different ways. The gold fish of China has been imported alive in water from Europe to this country. Tench and carp have been introduced into England in a similar way. Our lakes and rivers may be stocked with proper fish, by bringing spawn in jars in imitation of the Chinese, who often fetch the spawn of particular fishes from a great distance. Carps weigh from twenty to forty pounds, and live from one hundred and fifty to two hundred years; their fecundity is amazing; six hundred thousand eggs have been found in one carp. They may be carried ninety miles alive, packed in snow; and they are often fattened out of water, by being wrapped up in wet moss. Such a fish would be a great addition to our lakes. Success Pond, in the town of North Hempstead, was stocked, by Dr. Mitchill, with perch, which he conveyed alive from a pond forty miles off.

About fifty years ago, a Mr. Jacobi of Hanover, in Germany, after preparing a trough with gravel at the bottom, in a particular way, through which spring water was made to flow, took a female trout, and pressed and rubbed its belly gently, by which means it parted very easily with its spawn, without any prejudice to the fish, in a basin of clear water; he then took a male fish, and rubbed and pressed its belly gently, in the same manner, to let the melt, or soft roe, out, in the same basin where the female roe was in, and then stirred them together. The same result would follow if the roe was cut out of dead fishes and mixed together in the same way. He then spread the mixed spawn in the trough before the water was let in, and he then let in the water. A more particular account of this process is inserted in the 34th volume of the Philosophical Magazine. In this way he bred annually vast quantities of salmon, trout, and other fresh river fish.

It is calculated that one third of the inhabitants of Switzerland are maintained by fish from their fresh-water lakes. When we consider the number of lakes, ponds, and fresh-water streams, in our country, and the facility with which they may be supplied with the best kinds of fish, there can be no doubt but that, in course of time, this salubrious and copious source of subsistence will be considered an object worthy of attention.

NOTE D D.

It has been doubted whether red foxes, mice, rats, the common black fly, the Hessian fly, the honey bee, fleas, moths, bed bugs, and cock roaches, are indigenous to this country.

It appears that the unanimous testimony of the Indians is, that the red fox did not make its appearance until after the Europeans had settled the country, and this was after an extraordinary cold winter, when all the sea to the northward was frozen. Hence it has been inferred, that it came over from the north of Europe or Asia, on the ice. Another account is, that a gentleman of fortune, in New England, imported a number for the sports of the field, at the first settlement of that country, and that from this stock, was propogated the race. It is well understood, that our red fox is the same as that of the old world. Kamschatka abounds with them; and when Commodore Bering landed on the western coast of America, he saw several; and Lewis and Clarke also observed them on the west side of the rocky mountains. A very severe winter may have driven vast numbers from the regions of the north, into the lower country, about the time mentioned by the Indians, as it frequently has other animals, and particularly squirrels, deer, and bears. Severe cold produces famine, and famine causes the migration of men, as well as of other animals. Little credit is to be reposed in the opinions of savages on such subjects.

Almost all the other animals have probably been imported, but this does not disprove their being also aborigines of America. Fleas have been found on gray squirrels and rabbits, killed in desert parts of the country, where no human creature ever lived; and in new settlements made on pine lands they abound. The cock-roach, or blatta orientalis, is said to have been imported from the West Indies; but, on the other hand, it has been found in the midst of woods and deserts. The common mouse and the rat, have also been seen, at an early period, in the crevices of stones and subterraneous grottoes in remote mountains, where no human being had ever been before. The black rat is, probably, a native of America, and the gray rat imported from Europe.

It is, perhaps, still more difficult to discriminate between native and naturalized plants in many instances. In some cases, there is no dispute; but, I believe, it is doubted, whether the peach, the watermelon, and the parsnip, are indigenous.

NOTE E E.

This deduction is not a legitimate one. Honey might have been made by bees, specifically different from the common honey bee, and this appears to have been the case. Clavigero says, (*History of Mexico, vol.* 1.) "There are at least six different kinds of bees. The first is the same with the common bee of Europe, with which it agrees not only in size, shape, and colour, but also in its disposition and manners, and in the qualities of its honey and wax. The second species, which differs from the first only in having no sting, is the bee of Yucatan and Chiapa, which makes the fine clear honey of Estabentun, of an aromatic flavour, superior to that of all the other kinds of honey with which we are acquainted. The honey is taken from them six times a year, that is, once in every other month; but the best is that which is got in November, being made from a fragrant white flower, like jessamine, which blows in September, called in that country estabentun, from which the honey has derived its name. The third species resembles, in its form, the winged ants, but is smaller than the common bee, and is without a sting. This insect, which is peculiar to warm and temperate climates, forms nests, in size and shape, resembling sugar loaves, and even sometimes greatly exceeds those in size, which are suspended from rocks,

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or from trees, and particularly from the oak. The populousness of these hives are much greater than those of the common bee. The nymphs of this bee, which are eatable, are white, and round like a pearl; the honey is of a grayish colour, but of a fine flavour. The fourth species is a yellow bee, smaller than the common one, but like it furnished with a sting. Its honey is not equal to those already mentioned. The fifth is a small bee without a sting, which constructs hives of an orbicular form, in subterraneous cavities, and the honey is sour and somewhat bitter. The filalpipiolli, which is the sixth species, is black and yellow, of the size of the common bee, but has no sting."

Although this account destroys the inference from Cortez's letter, that the common honey bee of Europe existed in Mexico at the time he wrote it, yet it furnishes a strong argument in another respect. It appears that it is now in Mexico, and that there are five other kinds of bees which produce honey; and some of them, honey superior in flavour, and greater in quantity. Now, if this be the case, what inducement could there have been to import the bee of Europe?

In Africa and in Guiana, a bee exists which is, perhaps, only a variety of our honey bee; the difference in the honey, and the size of the bee, may be owing to the difference of food and climate. Adanson, in his voyage up the river Niger, was extremely incommoded by swarms of this insect, which visited the cabin of his vessel every day. "These bees," says he, "differ from those of Europe only in size. There is this singularity in their honey, that it never acquires a consistency like ours, but is always liquid, and like a brown syrup. We may affirm it is infinitely superior, both in delicacy and taste, to the best honey collected in the southern parts of France." *Adanson's Voyage to Senegal.*

Bancroft says, "The bees of Guiana are but little larger than the common house fly in England; their colour is black, and they are armed with stings; they deposite their honey in the cavities of hollow trees in the woods. This honey has a dark brown colour, a sweet but less agreeable taste than the European, and leaves a small bitter behind. It is found in large quantities, and is almost as fluid as olive oil; the colour of the wax is a dirty brownish black, and its substance somewhat softer than the yellow wax of Europe, having a sweet fragrant smell." *Essay on the Natural History of Guiana, &c.*

If the common bee did not exist in this country, without importation from Europe, then there was no creature in North America which produced honey, except in Mexico. It is not reasonable to suppose, that an animal, which is, in different species and varieties, so widely diffused over the rest of the world, should be denied to so extensive a portion of the globe, so well calculated for its sustenance.

It appears, that the opinion, that the honey bee was imported into this part of America from Europe, originated with Josselyn, who resided eight years in the Province of Maine, and wrote in 1672. Dr. Belknap says, that he "is the only writer who mentions them, and this was his opinion, with which tradition concurs." Kalm, who travelled through this part of the country in 1748, seems to have adopted Josselyn's idea. "The people were unanimous," says he, "that the common bees were not in North America before the arrival of the Europeans, but that they were first brought over by the English who settled here. The Indians likewise generally declare, that their fathers had never seen any bees either in the woods, or anywhere else, before the Europeans had been several years settled here. This is further confirmed by the name which the Indians give them; for having no particular name for them in their language, they call them English flies, because the English first brought them over; but at present they fly plentifully about the woods of North America. However, it has been observed, that the bees always, when they swarm, spread to the southward, and never to the northward. It seems as if they do not find the latter countries so good for their constitution; therefore, they cannot stay in Canada, and all that have been carried over thither died in winter. It seemed to me as if the bees in America were somewhat smaller than ours in Sweden. They have not yet been found in the woods on the other side of the Blue Mountains, which confirms the opinion of their being brought to America of late." *Kalm's Travels in North America, vol. 1.*

Upon this it may be remarked, that the country beyond the Alleghany Mountains was but very little known at that period; that, admitting the truth of Kalm's assertion, that bees naturally migrate southward, they might then have existed in this country, without having extended their travels to the cold climate where Josselyn wrote, and, consequently, might have escaped his observation; that the Indians might have been deceived by seeing bees flock to the vicinity of the white settlements, which they would naturally prefer upon account of the abundance of the food, and that, at all events, the opinions of the Indians on subjects of this nature are not entitled to weight; and that when Kalm states that the bee of this country is smaller than that of Sweden, it goes to prove that it is a variety, and probably indigenous.

Bartram says, "In the course of conversation with Dr. Grant of Mobile, I remarked that during my travels since leaving the Creek nation, and when there, I had not seen any honey bees. He replied that there were few or none west of the Isthmus of Florida, and but one hive in Mobile, which was lately brought there from Europe, the English supposing that there were none in the country, not finding any when they took possession of it after the Spanish and French. I had been assured by the traders that there were none in West Florida, which, to me, seemed extraordinary, and almost incredible, since they are so numerous all along the eastern continent, from Nova Scotia to East Florida, even in the wild forests, as to be thought *by the generality of the inhabitants, aborigines*

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of this continent." *William Bartram's Travels through the Carolinas and Floridas, in 1773.*

In Lewis and Clarke's expedition up the Missouri, (*vol.* 1.) it is stated, "We observed at the entrance of Maria's river, which is forty-seven degrees, twenty-five minutes, and seventeen seconds north, that the bee martin, or king bird, is common to this country, although there are no bees here, and, in fact, we have not met with the honey bee since leaving the Osage river." The junction of the Osage and Missouri is in latitude thirty-eight degrees, thirty-one minutes, sixteen seconds; and it is not likely that the honey bee would, contrary to the law of its migration, extend itself into the inhospitable regions of the north, unless invited by the cultivation of the country. This, therefore, proves nothing. The opinion of Bartram is deserving of respect, and it certainly leans in favour of what he considers the general sentiment, that the honey bee is an indigenous animal, and I can bear testimony to the truth of his remark, that they are numerous in the wild forests. In the most distant and extensive woods of the west, remote from all habitation and cultivation, this useful insect is to be found. In a new settlement on the Ridge Road, in Genessee county, a lonely and solitary place, I saw a bee-hive, composed of a piece of button wood, which was cut out of the woods full of bees. Dr. Williams, in his History of Vermont, (a work of great merit,) says, "From our earliest acquaintance with Lake Champlain, the honey bee was to be found in the open lands along those shores, at the distance of one hundred miles from the English or French settlements, and long before those settlements had begun to attend to the cultivation of this animal; and from the first settlement of New England hunting for their nests has been a favourite and profitable amusement." Upon the whole, although the balance of authority is greatly against the bee as an indigenous animal of North America, yet I am by no means satisfied that the weight of reason is not in the other scale.

Quære? Would it not be well to import the stingless bee of Mexico, that makes the aromatic honey of Estabentun, and also the bee of the Niger, whose produce is so superior, both in delicacy and taste, to the best honey of the south of France?

NOTE F F.

I HAVE made the number of serpents much too great. I do not believe there are twenty species in the whole United States.

Rattlesnakes are of two kinds: one considerably larger than the other. This serpent is never seen farther north than the mountains which surround Crown Point, in that direction. Henry saw one, two degrees farther north, to the northwest of French river, which discharges itself into Lake Huron. This circumstance was considered a very extraordinary one, and it greatly alarmed the superstitious fears of the Indians. It is not true that the hog is invulnerable to the attacks of the rattlesnake. He fights it as he would any other animal, and, if wounded, invariably falls a victim. In Lowthorp's Abridgment of the Transactions of the Royal Society, (*vol.* 3.) a story is told of a rattlesnake, in Virginia, which had got into a place where there were pigs; two dogs were set upon the snake, and were mortally wounded; "the howling of the dogs gave notice to the sow, and made her come furiously bristling, and she run immediately into her den; but being likewise bit by the snake, she set up a terrible squeak, and run also into the river, and there died."

Dr. Barton says, (in opposition to the vulgar opinion,) that the crepitaculum does not give any certain indication of the reptile's age; for that, in general, very old rattlesnakes have very few bells, or rattles; and he asks, "Do the young crotali, when alarmed or in danger, take shelter in the stomach (or œsophagus) of both their parents, or the mother only?" Carver says, "I once killed a female that had seventy young ones in its belly; but those were perfectly formed, and I saw them just before retire to the mouth of their mother, as a place of security on my approach." Several intelligent persons say the same of the common viper, in England, and yet the London viper catchers assert that it never happens. In the Transactions of the American Philosophical Society, respectable testimony is adduced to establish similar occurrences. It is said that wild pennyroyal, or dittany of Virginia, is fatal to this serpent, and that it never comes in places where it grows. See *Lowthorp's Philosophical Transactions, vol.* 2.

Van der Donk, in his account of the New Netherland, says, that there grows in New Netherland the snakeroot, which, as soon as the rattlesnake smells, he dies; that a large rattlesnake was found on Long Island, and some present took of that herb, and, after chewing it, fixed it on the end of a stick, and held it at some distance from the snake's nose, and that it no sooner inhaled the scent than it was seized with a fit of trembling, and died instantly; and that such was the rarity of the snake before his time, in 1655, that a man might go about into the fields and woods, and not see one in seven years; and that the Indians extracted its four sharp teeth, and used them as a substitute for lancets. Both these accounts of the deleterious effects of pennyroyal and snakeroot upon the rattlesnake, are fabulous.

Some of the most respectable ancient writers believed in the existence of a small kind of serpent, which moved forward and backward, and had two heads, one at each extremity. Galen and Ælian represented it as an undeniable fact; and Pliny says, "Geminum habet caput, tanquam parum esset uno ore effundi venenum." Linnæus has described this species of serpents as having rings on the body and tail, no scales, and a smooth, equal cylindrical body; the tail hardly to be distinguished from the head, and very obtuse. Dr. Bancroft, in his Essay on the Natural History of Guiana, observes, that it is said there are three kinds of double-headed snakes in Guiana. He saw but one species; it was twelve inches long; had very fine teeth, almost obscured by the gums; its eyes were hardly discoverable; and both ends have the same external appearance, from whence it has been thought to have two heads, although only one mouth is discoverable, which is small. From this it appears that those who believe in the reality of two heads, one at each extremity, labour under a mistake; and that their error has originated from the similarity of the head and tail, and the smallness of the animal. Herrera, in his History of America, says, that in Chiapa he found a two-headed serpent, eighteen inches long, in the form of a Roman T, and very venomous: it not only kills, says he, by its bite, but if any tread upon that part of the ground over which it has just gone, it proves fatal. Bancroft states, in a note to his work before referred to, that a similar kind of amphisbæna was found near a bay in Lake Champlain, in this state; but I shall give the account in his own words. "Since these sheets were sent to the press I have received a particular description of a monstrous amphisbæna, found near Lake Champlain, in North America, by an officer in the American service, who, with one of his majesty's draughtsmen, was, during the late war, sent to make a survey of that lake. They were previously informed by the Indians of the existence of these serpents, one of which they killed near a bay in Lake Champlain, which, in the maps of that country, has been since called Double-Headed Snake Bay. This serpent was a small one of the kind, it being about fifteen inches in length, and largest near the middle, terminating in a slender tail. The body, at the other end, divided into two necks of equal size, to each of which was joined a perfect head, with two eyes, a large mouth and throat, a forked tongue, with teeth of the same species with those of the rattlesnake. The colour of the heads was a dark brown, and the scales on the back and side were variegated with alternate spots of dark and reddish brown colours, in magnitude and disposition resembling those of the rattlesnake. This serpent was a perfect monster, of whose existence I should strongly doubt, did I not think the veracity of the gentleman from whom I have this information, and by whom it was actually killed, unquestionable."

The frontispiece of Bancroft's book contains a print of this serpent, and under it is inscribed,

"This snake was found near Lake Champlain, in the year 1761, by Lieutenant Moses Park."

This account is thus confirmed by the concurrent testimony of Carver:

"The two-headed snake. The only snake of this kind that was ever seen in America was found about the year 1762, near Lake Champlain, by Mr. Park, a gentleman of New England, and made a present to Lord Amherst. It was about a foot long, and in shape like the common snake, but it was furnished with two heads exactly similar, which united at the neck."

As this account relates to the natural history of this state, and the author is respectable, I have thought it sufficiently interesting to insert it with this interrogatory: Is there a bay on Lake Champlain which bears the name of *Double-Headed Snake Bay?*

Since writing the above I have seen a specimen of the false amphisbæna in Scudder's Museum. It was presented to the proprietor of that establishment by Dr. Mitchill, to whom it was given by Dr. Ross, who procured it in Jamaica. It is about eight inches long, and each extremity has the appearance of a head.

I have also seen in Dr. Mitchill's possession a real amphisbæna, or coluber biceps, having two heads at one end of the body, diverging from the same vertebral column. It is between four and five inches long, and the colour is a light brown. It was presented to the doctor by John G. Bogert, Esq. of this city, who procured it from Captain Henry G. Hose, who brought this and two others of a similar kind from Toconroba, one of the Fejee islands, to this city.

Dr. Mitchill informs me that he has seen a coluber biceps in the possession of Professor Walker, at Edinburgh; a second in Quebec, in the collection of General Davies; and a third was shown to him at Washington by President Jefferson; and from the frequency of their occurrence, the doctor is inclined to believe that this animal is not a lusus naturæ, but a regular production. If so, and his opinion is almost conclusive on such subjects, we must consider the real amphisbæna, or coluber biceps, as a new and distinct genus of serpents.

NOTE G G.

This is probably the glycine apios, or wild potato, which is nearly as good as the common, and which was, when boiled, a favourite food of the Indians.

The Jerusalem artichoke, or helianthus tuberosus, grows spontaneously over the country, is sometimes brought to our markets for sale, and is a wholesome, agreeable vegetable. This plant ought to be cultivated. It produces about four hundred and eighty bushels an acre. It flourishes in almost any soil, bringing, almost invariably, a certain crop, and it is also proof against the severest frosts.

The bulb of arrowhead, or sagittaria sagittifolia, boiled, or roasted in hot ashes, was eat by our Indians. It tasted nearly like potatoes. It is commonly an inch and a half long, and one inch and a half broad in the middle, is sometimes as large as a man's fist, and grows in low, muddy, and very wet ground. It composes a considerable part of the food of the Chinese, and is cultivated by them. It ought to be carefully guarded against swine, who eagerly devour it. In a valley to the west of the Rocky Mountains, which extends seventy miles, it is found in great abundance, and is a principal article of trade between the inhabitants of that valley and those of the sea coast.

Our Indians also made use of the root of a vegetable which they called tawho, tawkin, or tuckah, and which, Kalm says, is the arum virginicum, or wake robin. When fresh it has a pungent taste, but when roasted it is like potatoes. It flourishes in moist grounds and swamps, and often grows to the thickness of a man's thigh, but is nearly extirpated by the hogs.

They also eat the dried seeds of the orontium aquaticum, called by them tawkee; they were boiled in water, and eat like peas, or made into bread. This plant was plentiful in moist and low grounds. Whortleberries, or huckleberries, were dried by them and made into a dainty dish, by being mixed with fresh maize flour, and baked. They also gathered and dried hickory and black walnuts; took out the kernels and pounded them as fine as flour; mixed this substance with water, which took a milky colour, and was as sweet as milk.

The tuckahoe (or tawkee, as Kalm supposes) was probably a native of this state. The lycoperdon tuber of Linnæus, called truffles, grows here and in New Jersey, and we have a place called Tuckahoe. These tuberous productions are not the same. The Indians made delicious bread from their farinaceous matter.

According to Lewis and Clarke, the Indians of Columbia river eat the roots of a species of thistle, fern, rush, liquorice, and a small cylindric root, resembling in flavour and consistency the sweet potato.

NOTE H H.

THIS production has been used by the Indians from time immemorial. In a curious book, entitled A Description of the English Province of Carolana, by the Spaniards called Florida, and by the French La Louisiane, &c. by Daniel Coxe, Esq. printed, London, 1741, it is thus described: "Besides, this country naturally affords another sort of excellent corn, which is the most like oats of any European grain, but longer and larger; and I have been assured by many very credible persons, who, out of curiosity, had divers ways prepared it, that it far exceeds our best oatmeal. This is not sown and cultivated by the Indians, but grows spontaneously in marshy places, in and by the sides of rivers, like reeds or rushes. The Indians, when it is ripe, take handfulls, shake them into their canoes; what escapes them falling into the water, without any further trouble produces the next year's crop." Hearne saw it as far north as Churchill river, near the 60th degree of north latitude. Ellis, in his account of A Voyage to Discover a North West Passage, mentions, that there are great quantities of wild rice by the sides of the lakes and rivers which run into Hudson's Bay, between the 50th and 55th degrees of north latitude. On the 21st September, Pike stopped at a Sioux village, between Pepin and the Falls of St. Anthony, and in about 44 degrees 30 minutes north latitude, and found it evacuated, all the Indians having gone out to gather fols avoin; and he says, that the Indian traders chiefly depend for their support upon wild oats, of which they purchase great quantities from the savages; and that at an establishment on Red Cedar Lake, near the Mississippi, in the 47th degree of latitude, they give one dollar and fifty cents per bushel for it. The Menomeni, a nation of Indians inhabiting on the north west of Lake Michigan, are called, by the French, Fols Avoins, from this plant, which grows in great plenty among them. Henry, in his Travels in Canada and the Indian Territories, bought wild rice at Lake Sagunai in great abundance; he says it grows in shoal water, and the Indians gather it by shaking the ears into canoes. Hennepin says, that among the Fols Avoins it appears above the water in June, and is gathered in September, and that it produces more meal than European oats. Mackenzie asserts, that the Indians, on Lake Sagenuja, depend principally for food upon fish, and wild rice which grows spontaneously in

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these parts; that there is abundance of it on the banks of a small river which runs into the Lake of the Woods, about the latitude of 49 degrees; that from Lake Superior to Lake Winnipic, in latitude 50 degrees 37 minutes, "are vast quantities of rice, which the natives collect in August for their winter stores. To the north of fifty degrees it is hardly known, or at least does not come to maturity;" that the country between Lake Superior and the Mississippi was formerly very populous, and produced wild rice in great plenty. *Mackenzie's Voyages, Preface.*

Carver, in his travels through North America, states, that the Fox river is rendered remarkable by the abundance of wild rice that grows on its shores, and that this grain, which grows in the greatest plenty throughout the interior parts of North America, is the most valuable of all the spontaneous productions of that country. Exclusive of its utility, as a supply of food, for those of the human species who inhabit this part of the continent, and obtained without any other trouble than that of gathering it in, the sweetness and nutritious quality of it attract an infinite number of wild fowl of every kind, which flock from distant climes to enjoy this rare repast, and by it become inexpressibly fat and delicious. In future periods it will be of great service to the infant colonies, as it will afford them a present support, until, in the course of cultivation, other supplies may be produced; whereas, in those realms which are not furnished with this bounteous gift of nature, even if the climate is temperate and the soil good, the first settlers are often exposed to great hardships from the want of an immediate resource for necessary food. This useful grain grows in the water, where it is about two feet deep, and where it finds a rich muddy soil. The stalks of it, and the branches or ears, that bear the seed, resemble oats, both in the appearance and manner of growing. The stalks are full of joints, and rise more than eight feet above the water. The natives gather the grain in the following manner: nearly about the time that it begins to turn from its milky state, and to ripen, they run their canoes into the midst of it, and tying branches of it together just below the ears, with bark, leave it in this situation three or four weeks longer, until it is perfectly ripe. About the latter end of September they return to the river, when each family, having its separate allotment, and being able to distinguish their own property by the manner of fastening the sheaves, gather in the portion that belongs to them. This they do by placing their canoes close to the branches of rice in such position as to receive the grain when it falls, and then beat it out with pieces of wood formed for that purpose. Having done this, they dry it with smoke, and afterwards tread, or rub off the outside husk; when it is fit for use they put it into the skins of fawns, or young buffaloes, taken off nearly whole for this purpose, and sewed into a sort of sack, wherein they preserve it till the return of their harvest. It has been the subject of much speculation, why this spontaneous grain is not found in any other regions of America, or in those countries situated in the same parallels of latitude, where the waters are as apparently adapted for its growth, as in the climate I treat of. As for instance, none of the countries that lie to the south and east of the Great Lakes, even from the provinces north of the Carolinas, to the extremities of Labrador, produce any of this grain. It is true, I found great quantities of it in the watered lands near Detroit, between Lake Huron and Lake Erie, but, on inquiry, I learned that it never arrived nearer to maturity than just to blossom, after which it appeared blighted and died away. This convinces me, that the northwest wind, as I have before hinted, is much more powerful in these than in the interior parts, and that it is more inimical to the fruits of the earth, after it has passed over the lakes and become united with the wind which joins it from the frozen regions of the north, than it is further to the westward."

The reasons assigned by Carver, why this grain is not seen in a state of maturity, to the east nor to the south of the Great Lakes, are unsatisfactory. The northwest winds are mitigated in passing over those immense bodies of water, nor is his assertion warranted by the fact. This rice certainly flourishes to the south of the lakes, and we have the authority of Kalm to support us in stating, that it grows to the east. The only difficulty exists as to the degree of latitude by which its growth is bounded; and it is believed, that Mackenzie limits its northern extension too much. Kalm says, that on the 16th of July he saw it growing on the western side of Lake Champlain, near Crown Point, in this state, and in the 44th degree of north latitude; and again he mentions, that the zizania aquatica, or folle avoine, grows plentifully in the rivulet, or brook, which flows somewhat below Prairie de la Magdalene, a small village on the eastern side of the river St. Lawrence, about eight miles from Montreal; and that its seeds are gathered in October, and taste almost as well as rice. Dr. Williams says, that it is a native of Vermont. A considerable difficulty exists with respect to the botanical arrangement and denomination of this plant. Linnæus, and after him Kalm, calls it zizania aquatica. M. Desfontaines, in his tableau de L' Ecole de Botanique du Museum D'Histoire Naturalle, thus mentions it, quoting Linnæus for his authority, zizania aquatica grows in the northern parts of America, is an annual plant, and is alimentary. Michaux, in his Flora Boreali-Americana, makes three species.

1. Milacea, } growing in the watery parts of North America.
2. Clavulosa, }
3. Fluitans—at Lake Champlain.

Of the second he says, this is the zizania of Gronovius, which Linnæus has improperly arranged with the Sloanina.

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Persoon, in his Synopsis Plantarum, designates, besides those enumerated by Michaux,

Aquatica, } varieties, the first growing in Jamaica, under water, and the latter, in the
Palustris, } waters of North America.

And Terrestris—on dry land.

Muhlenberg, in his Catalogue of the Native and Naturalized Plants of North America, enumerates four species of zizania, or American rice.

1. Miliacea—millet.

2. Clavulosa—an annual plant, vulgarly called wild rice, or oats, grows in Pennsylvania, flowers in September.

3. Palustris—marsh; risave—Canada.

5. Fluitans—floating.

Dr. Barton considers the zizania clavulosa of Michaux, as the zizania aquatica of Linnæus, and says, that it grows and ripens its seed as far north in America, as the latitude of 50 degrees; and that the zizania milacea of Michaux, is a very distinct species, and that both of the species are eaten by the Indians of the countries adjacent to the lakes. Amidst such a number of clashing authorities, it would not become me to offer an opinion. It is possible, however, that the zizania of Lake Champlain, is only a variety of the folle avoine; and it is, probably, a distinct species from the zizania of Pennsylvania. Providence appears to have intended this northern rice as a substitute for the rice of southern climates. Its produce is abundant; its alimentary qualities are undoubted; and the time may arrive, when the zizania aquatica of the north shall, under the hand of cultivation, attain to as high perfection, and contribute as much to the subsistence of the human race, as the oryza sativa of the south.

NOTE II.

In strictness there are but two species of wheat—with beards, and without beards. Winter, summer, gray, duckbill, gray pollard or fuller wheat, cone wheat, Polonian wheat, Siberian spring wheat, Switzerland spring wheat, Ægyptian bearded wheat, Murwaary wheat, brought from Barbary, German spelter, Zeeland wheat, and froment tremois, so called because it is only three months in the earth, all varieties of one or the other of these species, have been in a greater or less degree cultivated in England, and each has some peculiar recommendation. I have seen lands in this state which have produced fifty bushels an acre of this most excellent of the cerealia.

In the Transactions of the Linnæan Society, it is stated, that the blight of wheat, (uredo frumenti,) in the west of England, which was attributed to an insect, was owing to a fungus which had been long sown in the stem of the wheat. Sir Joseph Banks, in an excellent essay on the blight in corn, annexed to Curtis's Practical Observations on the British Grasses, has embraced the same opinion, and says, that the blight is occasioned by the growth of a minute parasitic fungus, or mushroom, on the leaves, stems, and glumes of the living plant; and he further states, that it has long been admitted by farmers, though scarcely credited by botanists, that wheat, in the neighbourhood of a barberry bush, seldom escapes the blight; that the village of Rollesby, in Norfolk, where barberries abound, and wheat seldom succeeds, is called by the opprobrious appellation of mildew Rollesby; that some observing men have, of late, attributed this very perplexing effect to the farina of the flowers of the barberry, which is, in truth, yellow, and resembles, in some degree, the appearance of the rust, or what is presumed to be the blight, in its early state, and that it is notorious to all botanical observers, that the leaves of the barberry are very subject to the attack of a yellow parasitic fungus, larger, but otherwise much resembling, the rust in corn. In opposition to the idea, that it is improbable that these fungi are the same, it is remarked that the misletoe, the best known parasitic plant, delights most to grow on the apple and hawthorn, in England, but that it flourishes occasionally on trees widely differing in their nature from both of these; and in the middle states of America it is most frequently found on the nyssa sylvatica, or sour gum, but to the southward upon oaks.

An insect, called the tipula tritici, or wheat insect, has destroyed, in some places in England, about one twentieth part of the produce. An insect, called the ichneumon tipulæ, deposites its egg in the larva, or caterpillar, of the wheat fly, and this destroys it. Dr. Darwin gravely proposes, in his Phytologia, to counteract the pernicious effects of insects which produce blight, by propagating the larva of the aphidivorous fly. It is not yet settled whether the hessian fly is of foreign or domestic origin: although a species of tipula, yet it is not the one just mentioned, as I am informed. The farmers on Long Island complain of the septennial ravages of an insect which destroys their barley, and which they denominate the army worm, from its numbers.

Dr. Barton has very justly remarked, that it is an object of the first importance to investigate the natural history of those insects, which are peculiarly injurious to us in any way, and that unfortunately our country, as much perhaps as any on this globe, abounds with such insects.

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Dr. Smith, the celebrated President of the Linnæan Society, observes, that botany necessarily leads to the study of insects; for it is impossible to investigate plants, in their native situations, without having our attention perpetually awakened by the infinite variety of those active little beings, employed in a thousand different ways, in supplying themselves with food and lodging, in repulsing the attacks of their enemies, or in exercising a more than Asiatic despotism over myriads below them; and he exultingly exclaims that, in England, no branch of natural history, after botany, has, for some years, had more attention paid to it than entomology: while with us, to adopt the language of Dr. Barton, "Notwithstanding the importance of the science of entomology, the history of our insects has hitherto excited but little attention."

NOTE K K.

Mr. Green, in his Discourse on the Botany of the United States, pronounces, that the fiorin grass is a native of this country; that it has been discovered in Sussex county, New-Jersey, on the margin of the Genessee river, and on an island below the city of Albany. Whether this be the same as the fiorin grass of Europe is still a question *sub judice*. In 1749 Kalm visited the island below Albany, and in his journal he has mentioned several of its vegetable productions: the agrostis stolonifera, if growing there at that time, escaped his penetrating eye; but, whether indigenous or not, we know that it has been imported and successfully cultivated; that its alimentary qualities, and its crops, are great beyond example, and that it flourishes in defiance of soil, drought, and climate.

I do not know that saintfoin, or sainfoin, (hedysarum onobrychis,) which signifies wholesome hay, has succeeded as well in this country as in France, from whence it is derived. The milk of cows fed on it is nearly double, and makes most excellent cream and butter. It fattens sheep better than any other food, and horses require no oats, although hard worked, when they are fed with it. Its increase of produce exceeds that of common grass land about thirty times, and it will last from ten to fifteen years. It yields an aftermath, or second crop.

Curtis, in his Practical Observations on British Grasses, speaks slightingly of the festuca ovina, and says that it appears to him applicable only to the purpose of making a fine-leaved grass-plot, that shall require little or no mowing. On the other hand, Withering, in his botanical arrangement of all the vegetables naturally growing in Great Britain, intimates that the superiority of the Spanish and English wool is owing to the abundance of this grass in the hilly pastures where the sheep are kept.

Curtis has enumerated twenty-five genera, and one hundred and twenty-three species, of grasses growing in Great Britain, and has judiciously remarked, that to constitute the herbage of a good meadow there must be a combination of produce, bateableness, and early growth. *Bateable* is altogether an agricultural or provincial term, and he uses it to express cattle's thriving on the food they eat.

The best grasses of Europe have been neglected, and our indigenous ones have been, in a great measure, overlooked by us. Let our scientific men, our practical men, turn their attention to this and other important branches of husbandry, as yet scarcely noticed, and affording inexhaustible topics for investigation, and let them be encouraged in their labours by the observation of Bacon, that "Virgil got as much glory of eloquence, wit, and learning, in the expressing of the observations of husbandry, as of the heroical acts of Æneas."

NOTE LL.

This grass produces a fine perfume, and has the same effect on tobacco as the vanilla bean. It delights in a rich soil, and may be easily cultivated. It is greatly superior, in its odoriferous qualities, to the anthoxantum odoratum, or sweet-scented vernal grass, the only one of that kind which grows in England. Cattle are very fond of it, and it must produce the most delicious milk, butter, and butchers' meat. There is, however, great danger of its total extirpation, as it is very scarce. Indeed, the same danger is to be apprehended, and the same fatality has, no doubt, occurred in other instances. Hudson, on the 6th of September, sent a boat to sound the Kills between Bergen and Staten Island, and his men on their return reported, that the "Lands were as pleasant with grass and flowers, and goodly trees, as ever they had seen, and very sweet smells came from them." This is not now the case. The grazing of cattle, the rooting of swine, the plough, and other implements of agriculture, have entirely destroyed a great number of the annual grasses and plants which formerly flourished in this country. Several persons told Kalm, so far back as 1748, that the loss of many odoriferous plants, with which the woods were filled at the arrival of the Europeans, but which the cattle have now extirpated, might be looked upon as a cause of the greater progress of the fever; for that the great number of those strong plants occasioned a pleasant scent to rise, in the woods, every morning and evening. The vegetable kingdom of our western country is uncommonly rich, and luxuriantly abundant, because cultivation has been but partially extended to it. Hogs have produced great destruction among all tuberose and bulbous plants. Even the laurel tree of Carolina has become almost extinct in many parts of the country, owing to the depredations of domesticated animals.

Although some plants, like some animals, are no longer seen in our country, yet the field of botanical investigation is immeasurable and boundless. Our country embraces every variety of soil and climate, mountains, rivers, lakes, and salt waters, and is the favourite depositary of the vegetable riches of the earth. In the United States, we are yet in the infancy of this science.

The first edition of Linnæus's Species Plantarum contains only 7,300 species. A curious amateur of botany took the pains to enumerate the plants described in Dr. Turton's translation of Gmelin's edition of the Systema Naturæ, and in a work of Willdenow, and found 2,046 genera, and 19,803 species of plants, of which 638 genera have but one species; 263 but two; 174 but three; and 124 but four. And it is supposed, that the whole number of described plants amounts to about 22,000.

Mr. Jacob Green has annexed to his well-written and interesting Address on the Botany of the United States, (delivered before the Society for the Promotion of Useful Arts,) a Catalogue of plants indigenous to the state of New-York. This list, which Mr. Green admits to be incomplete, contains about 403 genera, and 1,283 species.

The Catalogue of the hitherto known native and naturalized plants of North America, made by that indefatigable and learned botanist Dr. Muhlenberg, contains but 863 genera, and not 2,800 species. It is not unreasonable to estimate the whole number of plants in the United States, and their territories, at 8,000; and as yet we have not described 3,000. What an opening does this afford for the operations of scientific inquiry? No wonder that Linnæus was so anxious to visit this country. Catesby, in his Hortus Europæ Americanus, published in 1767, truly observes, that a small spot of land in America has, within less than half a century, furnished England with a greater variety of trees, than has been procured from all the other parts of the world, for more than a thousand years past.

From information which has recently reached me, I am persuaded, that our Dutch ancestors paid more attention to the improvement and natural history of the country, than has been generally imagined. We are, as yet, greatly in the dark with respect to events and observations during their occupancy of New Netherland, as they termed their country; but the means of information are amply within our reach. De Laert wrote a book respecting it, wherein he gives a very particular account of the Indians; and Megapolensis, an eminent Dutch minister, who formerly lived in this city, also published a work on this country when a Dutch province; and I have now before me a manuscript translation, made by the Rev. Dr. Bassett, of Dr. Van der Donk's History of New Netherland, published in 1655. It is very interesting, and it is to be hoped, that that worthy gentleman will meet with sufficient encouragement to publish it, and also correct translations of De Laert and Megapolensis, for which no man in this country is better qualified. Van der Donk states, that a certain surgeon, a resident of New Netherland, had formed an extensive botanical garden, in which he planted many medical roots, which he cultivated from the woods adjacent to his abode; but, by the removal of that worthy gentleman from the country, his humane and patriotic exertions were lost to the world. This, I undertake to say, was the first botanical garden established in this part of America. It appears, also, from this work, that most of the medicinal and other herbs, with which the country abounds, were known to our Dutch forefathers; that they took uncommon pains to introduce the best cereal gramina, legumens, and excellent vegetables, and fruit of various kinds, and have even cultivated Canary seed; that they introduced the white and red, the cornelian and stock roses, wall flowers, tulips, imperial flowers, the white lily, and lily of the valley, ladies' rose, violet, and gold flower, and that the country abounded with flowers peculiar to it, of the most beautiful kind, to which the European was an entire stranger; viz. the sunflower, the red and yellow lily, the morning glory, the white, yellow, and red marygold, a species of wild eglantine, the different kinds of the bell flower, and many others.

Our Dutch ancestors also turned their attention to improving the dyes of the country: great hopes were entertained from the wild indigo; and they not only supposed that the common indigo might be raised to great advantage, but they actually tried the experiment. Seed was imported from Holland. The first attempt failed, owing, as it was supposed, to an extraordinary drought which prevented the plant from coming to maturity; but another experiment completely succeeded: the seed was sown near New Amsterdam, (New-York,) and a great crop was obtained; specimens were sent to the mother country, where good judges pronounced it of a superior quality. But what is still more extraordinary is, that there is reason to believe that it was contemplated to introduce the famous orchilla weed. When the Spaniards discovered the Canary Islands, they sought for it as eagerly as they did for gold: It was probable, that it was made use of to produce the gertulian purple of the ancients; and they also had in their view other vegetable dyes, which we cannot now accurately designate. "The *crap plant*," says Van der Donk, "for dying red, is not cultivated in New Netherland, but it is not to be questioned, that if it were tried it would yield well."

I must repeat my wish, that this curious work may soon see the light. It appears from it, that the country was so remarkably healthy at that time, that it was a strange thing to hear of a person being sick; that the east wind did not extend far west; and that the climate was as mild at that period as it now is.

NOTE M M.

See Busching's Geography, vol. 1. Temple's Works, vol. 3. Walpoliana. There can be no doubt but that several species of some of these trees existed in a wild state at home, previous to their introduction from foreign countries. It is presumable, for instance, that the chesnut always grew in Italy, and the cherry in France; but different kinds, on account of their superior excellence arising from cultivation, were imported by the ancient Romans. Wherever their arms extended, they availed themselves of the choice fruits of the conquered countries, and the great generals who brought them to Rome took pride in giving them their own names, as in memory of some great service or pleasure they had done their country; so that not only laws and battles, but several sorts of apples or mala, and of pears, were called Manlian, and Claudian, Pompeian, and Tiberian, and by several other such noble names. Thus, in process of time, the inhabitants of Italy, who formerly lived on acorns, made the whole world tributary to their subsistence, as well as to their glory. Humboldt, in his Account of New Spain, (*vol.* 2.) says, that the prunus avium is indigenous in Germany and France, and has existed from the most remote antiquity in their forests, like the robur and the linden tree; while other species of cherry-trees, which are considered as varieties, become permanent, and of which the fruits are more savoury than the prunus avium have come to those countries through the Romans from Asia Minor, and particularly from the kingdom of Pontus.

Turnips and carrots are considered indigenous roots of France; our cauliflowers came from Cyprus; our artichokes from Sicily; lettuce from Cos, and shallots, or eschallots, from Ascalon. The art of gardening was introduced into England from the continent about 1509, prior to which most of the present produce of kitchen gardens was imported from the Netherlands.

NOTE N N.

The comparative mortality of London has not only greatly diminished within the last fifty or sixty years, but a number of diseases which, previous to that period, were very destructive, have almost entirely disappeared; for instance, the plague, the rickets, and the scurvy: while others that were formerly considered very mortal, are now viewed as no longer formidable; such as the small pox, the dysentery and intermittent fevers.

Other diseases, supposed to be less dependent on the physical than on the moral and political changes which Great Britain has undergone, have increased in number and fatality; and are attributed, chiefly, to the increase of manufactures; and, consequently, of the number of sedentary and otherwise unwholesome occupations; to the augmentation of the national wealth, and with it, of luxury and high feeding; and to the fluctuations in the conditions of life, attendant on the spirit of commercial speculation. To the first of these sources is ascribed, in part, the regular increase of the consumption, during the last century; to the second, the more inconsiderable, but scarcely less regular, increase of apoplexy, palsy, gout, and sudden deaths; and to the last, the more frequent occurrence of insanity in its different forms: and the increase of intemperance and vice, in a large and populous city, doubtless contributes much to the augmentation of all these diseases.

Dr. Heberden states the proportion of these three classes of disease, at the beginning, middle, and end, of the eighteenth century, to have been as follows:

	Beginning.	Middle.	End.
Consumption,	3,000	4,000	5,000
Palsy, apoplexy, &c.	157	280	300
Lunatic,	27	75	70

If we compare the mortality from consumption, at those three periods, with the total mortality, we find, that in 1669 the deaths, from consumption, were, to the whole, as,

	1	to about	6	2
In 1749,	1		5	5
1799,	1		3	8
1808,	1		3	6

The reports of consumption, in other parts of Great Britain, correspond, in a great degree, with the accounts of its prevalence in London, and, therefore, render this ascription of its causes and origin unsatisfactory.

Dr. Lettsom, however, in a letter to Dr. Hosack, on the diseases of London, (*Amer. Med. and Phil. Reg. vol.* 2.) says, "Whilst the phthisis pulmonalis is rapidly increasing in America, and in the European continent, it is *diminishing* here. The croup is less fatal, in consequence of the immediate and free use of the lancet, and of leeches, with purgatives, than heretofore; nor is angina scarlatina either so frequent or so fatal. The typhus is almost extinct, and the cholera morbus is unfrequent; and, as far as my experience extends, the syphilis is milder, or easier cured; and, lately, such has been the prolongation of health and life as to lessen the premiums of insurance considerably."

Out of 19,354 deaths, in London, in 1808, 5,220 are ascribed to the consumption. The christenings, in that year, were 19,906, nearly equal to the burials.

In 1809, the healthiest year which London ever enjoyed, there were 16,680 deaths, 4,570 of which were produced by the consumption; the number of christenings was 19,612, making the excess of births above the deaths nearly 3,000. (See the London Annual Medical Review and Register, for 1808 and 1809.)

Dr. James E. Smith says, that "In Italy, consumptions are found to be very contagious, though less evidently so in England." It is intimated, if my memory serves me, in that excellent work, the Emporium, that the general use of cotton shirts, &c. may have a pernicious influence in producing this disease. Its increased fatality in Europe, as well as in America, is, probably, owing to a complication of causes; and, indeed, the periodical prevalence and disappearance of certain diseases, must be classed among those arcana which providence has concealed from man.

Salubrious as the climate of Madeira is generally reckoned, we find, that even there pulmonary diseases cut off a great number of the inhabitants. Of the various districts of North America, New-York has been considered, by many, as being especially favoured with regard to the mildness of its seasons; and the changes of its weather were referred chiefly to the difference in the prevailing winds. Among a series of interesting remarks on the climate and diseases of New-York, made by Lieutenant-governor Colden, about seventy years ago, and inserted in the American Medical and Philosophical Register, vol. 1. this medical philosopher observes, "The air of the country being almost always clear, and its spring strong, we have few consumptions, or diseases of the lungs." "People inclined to be consumptive in England, are often perfectly cured by our fine air; but if there be ulcers formed they die. The climate grows every day better, as the country is cleared of the woods; and more healthy, as all the people that have lived long here testify. This has even been sensible to me, though I have been but about twelve years in this country; *I, therefore, doubt not but it will, in time, become one of the most agreeable and healthy climates on the face of the earth.* As it is at present, I prefer it to the climates of England, and, I believe, most people that have lived any considerable time here, and have returned to England, will confirm this."

If the climate of New-York was formerly thus mild and healthy, and a constant amelioration in its temperature is consequent upon our numerous settlements and improvements, as has been maintained by many distinguished writers, to what shall we ascribe the extraordinary mortality occasioned by pulmonary consumption at the present day? None will deny this disorder to be influenced by climate, and independent of effects arising from particular employments, and modes of living; but we will, perhaps, find the most satisfactory answer to this question, in considering phthisis in its various forms as the offspring rather of increased dissipation, of great imprudence in dress, and of consequent exposure to sudden changes of temperature, than of any peculiarity in our climate and seasons.

This opinion of the origin of this disease is further confirmed, upon reflecting upon its nature. Consumption is reckoned, by a practical observer, Dr. Hosack, who has devoted a large share of attention to this subject, (*Quarterly Reports on the Diseases of New-York*,) as being in a great majority of instances in its primary or forming stage, an inflammatory complaint, the effects of cold; and as yielding to the treatment indicated for the removal of inflammation, when affecting other parts of the chest.

"We have, in many instances, employed blood-letting with the most happy effects, in many cases of incipient *phthisis*, even where strong hereditary predisposition existed. Indeed, we are induced, from some late observations on this subject, to express the opinion, that in the commencement of phthisis, as in peripneumony, blood-letting is not sufficiently employed, but is too frequently neglected until the inflammation has so far extended that suppuration becomes inevitable. Nor do physicians, in general, appear to have been sufficiently attentive in describing the symptoms characteristic of the first or inflammatory stage of phthisis, and, consequently, have been regardless of that active antiphlogistic treatment which alone can prevent the tuberculous or suppurative stage. Inasmuch as suppuration, or a purulent secretion from the lungs necessarily implies preceding inflammation, we conceive too early attention cannot be given to the premonitory symptoms which announce the inflammatory stage, but which are frequently so inconsiderable, being seated in the less sensible, the cellular portion of the lungs, that both physician and patient are alike regardless of the present symptoms, and of the consequences to which they lead. Instead, therefore, of trusting to *sirups, anodynes, pectorals*, or *ptisans*, to allay the occasional dry hacking cough and pains of the chest, which indicate

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the first approach of the disease, we earnestly recommend the same active treatment, by *blood-letting*, blisters, and other means of diminishing excitement, as are employed in the treatment of a pleurisy, or any other acute inflammation; and we could add, in confirmation of our view of this subject, many recent cases, in which the practice here recommended has been attended with the most happy results." *American Medical and Philosophical Register, vol.* 2.

NOTE O O.

Contagion and infection are subjects which have been fertile of discussion and controversy. Their peculiar character, and the agency which they exert in giving origin to, and modifying the form of, diseases, seem to have attracted, at a very early period, a large share of attention. Among the ancient physicians we find Galen, in express terms, stating the manner in which plague is communicated; et quidem quod aëris pestilens febrem afferre consuevit, nemo sanæ mentis dubitavit, sicuti et pestilenti morbo laborantium conversatio periculosa, ne inde contagium contrahatur, quemadmodum ex scabie et lippitudine. (*Galen. de Differ. Febr.*) Livy, the historian, appears to have been duly sensible of the power of contagion; et primo temporis ac loci vitio, et ægri erant, et moriebantur: postea *curatio ipsa et contactus ægrorum* vulgabat morbos; and in describing a pestilential disorder which prevailed in the early part of the fourth century, A. U. C., he again remarks, *vulgatique contactu* in homines morbi. (*Lib.* iv. *cap.* xxx.) Soon after the restoration of learning, when the stock of knowledge preserved by the Arabians was increased by new facts and discoveries, and medical science was augmented by the laborious investigations of that prolific age, we find Diemerbroeck and others devoting especial attention to this subject. Though a difference of opinion existed, it is manifest that a large majority of physicians maintained the general doctrines of contagion.

At a more recent period the great mortality which accompanied the different attempts at colonization in the West-India islands, and on the coast of Africa, called the minds of medical observers to the peculiar nature of intra-tropical diseases. The appearance of the *yellow fever* at Boulam, in 1793; its general prevalence in most of the West-India islands; and, subsequently, its more extensive diffusion in different parts of the United States, have been the means of enlarging the original limits of the controversy, and have given to the discussion an interest inferior to none among medical inquiries. Preëminent among the European authors who have entered upon this discussion, may be considered the celebrated Dr. Chisholm and Dr. Haygarth, whose respective writings on the malignant yellow fever are monuments of the learning and talents of their authors, and may be pronounced the most able and satisfactory works in support of the doctrines which they have espoused; as the writings of our late distinguished countrymen, Doctors Rush and Miller, may be referred to as containing the best summary of the theories which these authors have embraced.

Although the specific nature of the matter by which certain diseases are propagated is still imperfectly understood, yet it were idle to deny the existence of contagion; and it is certain we have recently ascertained, in no inconsiderable degree, the laws by which it is governed. "In the present state of medical knowledge," says the Edinburgh Review, "it would not, we conceive, be at all more absurd to deny the existence of fever altogether, than to maintain that it is not propagated by contagion." *Review of Dr. Haygarth's Letter to Dr. Percival.*

An attempt was made by the late Dr. Richard Bayley, of New-York, to establish a distinction between *contagion* and *infection*, and to discriminate the diseases arising from these *two* different sources. (*Treatise on the Yellow Fever of New-York*, 1795.) This distinction has been adopted by some European physicians, and, among others, by Dr. Joseph Adams, but without the due acknowledgment.

About the year 1797, Dr. Mitchill promulgated his ingenious doctrines on the pestilential fluids; and in 1804, Dr. Edward Miller made public his Attempt to Deduce a Nomenclature of certain Febrile and Pestilential Diseases from the origin and nature of their remote cause. *Medical Repository, vol.* 1. & 7.

In July, 1808, a new theory on the laws governing the communication of contagious and infectious diseases, was published by Dr. Hosack, in a letter addressed to Dr. Colin Chisholm. (Vide *Edin. Med. and Surg. Journal, vol.* 5.) Dr. Hosack admits the distinction proposed by Dr. Bayley to approach nearer the truth than any other that had hitherto been offered, but he does not consider it as presenting a view of the whole truth. Those diseases which are communicable from one person to another, and are generally considered of a contagious or infectious nature, are distributed by Dr. H. into three classes. First, such as are communicated exclusively by *contact;* as itch, syphilis, sibbens, Laanda of Africa, frambæsia, elephantiasis, variola vaccina, and hydrophobia: secondly, such as are communicable by *contact* and the *atmosphere;* as small-pox, measles, chicken-pox, hooping-cough, scarlatina, and cynanche maligna: thirdly, those diseases generally communicable only in an *impure* air; as plague, yellow fever, typhus, in its various forms, and dysentery.

The following extract is taken from the introductory part of Dr. Hosack's letter:

"The visiter or attendant contracts disease from one of *two sources*, either from the filth of the sick room, or from a *specific something* issuing from the body of the sick, the consequence of the peculiar disease under which he labours. If a person visiting another ill of the *yellow fever*, or *plague*, derives his disease from the *impure atmosphere* of the apartment, I ask, how it happens, that in all instances he contracts the *same disease* with that of the person whom he visits? Why is his disorder not an *intermittent*, a *remittent*, *jail fever*, or *dysentery*, which are considered the usual produce of filth? If he derives any thing specific from the sick, his disease is then assuredly not to be considered as occasioned by the *atmosphere*, but depending on the *peculiar condition of the fluids*, or state of the system, induced by the action of a specific poison; in other words, it is to be considered a *contagious* disease. The distinction proposed by Dr. Bayley, inasmuch as it does not account for the communication of the *peculiar form* of fever or disease which is thus propagated, I therefore consider to be insufficient to account for the circumstances attending the communication of those diseases to which it is applied. That I may not be misunderstood, I will suppose A to be ill of *dysentery*, a disease well known to be attended with a *peculiar train of symptoms;* he is in a small confined apartment, his person is neglected, the atmosphere around him is rendered impure and offensive; under these circumstances B visits him, and a few days after is also taken sick with the *same disease*, attended in all respects with the *same* dangerous symptoms which characterize the disorder of A. Dr. Bayley, and those who adopt the doctrine of *infection* as opposed to *contagion*, consider the disease of B to proceed from the *impurities of the air of the chamber*, and not from any thing *peculiar* emanating or secreted from the body of A. But as we may, *without hazard*, visit an equally filthy chamber where C lies ill of *cholera morbus*, or D with a *broken limb*, I therefore ascribe the disease of B to something more than the *impure air* of the chamber of A. I ascribe it to a *peculiar virus* generated in his system by the disease under which he labours, and communicated by his excretions to the surrounding atmosphere, rendering it thus capable of producing the same disease in those who may be exposed to its influence."

Europe is already greatly indebted to that spirit of investigation which characterizes the professors of the healing art in this country; a spirit which has led to the overthrow of many errors, and to the discovery of new physiological and pathological principles; which has prompted its professors to exertions that have eminently contributed to the general adoption of a more judicious treatment of many disorders, to the rejection of numerous inert substances inserted into the materia medica, and to the augmentation of the list of those of approved medicinal virtues; to a more liberal use of vigorous remedies, and to a more bold and successful method of practice.

This view of the laws regulating the communication of contagious disorders proposed by Dr. Hosack, greatly limits the ground of controversy; and I am gratified in adding that it has met with a most favourable reception with the physicians of Europe, and has reflected great honour on the state of medical learning in this country. (See the *London Ann. Med. Review*, for 1809; the *Edin. Med. and Surg. Journal.*) For more able details on the subjects of contagion and infection, and for the histories of various epidemics which have prevailed in the United States, the reader will consult that valuable periodical journal, the Medical Repository, edited by Drs. Mitchill, Smith, and Miller; the Philadelphia Medical Museum, by Dr. Coxe; the American Medical and Philosophical Register, conducted by Drs. Hosack and Francis; and the Massachusetts Medical Communications.

The following note refers to the account of Bacon and Coke, in the 41st page, and was accidentally omitted.

Having frequently referred to Francis Bacon, (Lord Verulam, and Viscount St. Albans,) it may not be amiss to mention his melancholy fall. Pope says,

> "If parts allure thee, think how Bacon shin'd,
> The brightest, wisest, meanest of mankind."

In March, 1620, a committee of the house of commons, appointed to inquire into abuses in the courts of justice, reported specific charges of corruption against him in the execution of his office of Lord Chancellor of England. His antagonist, Sir Edward Coke, who was then a member, was one of the committee appointed to draw up the charges against him; and he was finally impeached before the house of lords. He at first avoided an investigation on the plea of sickness; but finally, on the 30th of April, he made a humble and contrite confession, and admitted that, *pendente lite*, he had received large sums of money, and other douceurs, from suitors in his court, and he was fined forty thousand pounds, imprisoned in the Tower during the king's pleasure, rendered incapable of holding any office, place, or employment, and of sitting in parliament, or coming within the verge of the court. The king afterwards set him at liberty, and gave him a pension. He lived obscurely in his chambers at Gray's Inn, where his lonely and desolate condition so wrought upon his melancholy temper, that he pined away, and, after all his affluence, he

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was reduced to so low an ebb as to be denied beer to quench his thirst; for, having a sickly stomach, and not liking the beer of the house, he sent now and then to Lord Brook, who lived in the neighbourhood, for a bottle of his beer, and after some grumbling the butler had orders to deny him.

He died on the 9th of April, 1626, in the sixty-sixth year of his age—a melancholy example of great powers of mind connected with profligacy of heart.

Sir Edward Coke was tainted with the scholastic learning of the times, and was scurrilous and malignant in the extreme. As attorney general he conducted the prosecution for high treason against the illustrious Sir Walter Raleigh, in the most barbarous manner. As a specimen of his manner I have made the following extracts:

"Here is mischief, mischief in summo gradu, exorbitant mischief. My speech shall touch these three points—mutation, supportation, and defence."

"There is treason in the heart, in the head, in the mouth, in consummation; comparing that in corde to the root of a tree; in ore to the bud; in manu to the blossom; and that which is in consummatione to the fruit."

In the course of the trial several altercations took place between him and the prisoner; in one of which he thus addressed Raleigh:

"Thou hast a Spanish heart, and thyself art a spider of hell."

At one time one of the court gently checked him, on which he sat down in a great rage, and would not proceed until after several urgent entreaties. At the repeating of some things Raleigh interrupted him and said he did him wrong, upon which the following curious dialogue took place, in which Raleigh handled him with great, but just, severity.

"*Attorney.* Thou art the most vile and execrable traitor that ever lived.

Raleigh. You speak indiscreetly, barbarously, and uncivilly.

Attorney. I want words sufficient to express thy viperous treason.

Raleigh. I think you want words indeed; for you have spoken one thing half a dozen times.

Attorney. Thou art an odious fellow; thy name is hateful to all the realm of England for thy pride.

Raleigh. It will go near to prove a measuring cast between you and me, Mr. Attorney."

Raleigh was condemned, and was imprisoned fourteen years in the Tower, where he devoted himself to study and writing. He was afterwards liberated, and permitted to look for a mine in America, where, having given offence to the king of Spain, he was sacrificed to the resentment of that government, and executed on his old sentence, in 1618. Just before his decapitation, he took the ax from the executioner, and, smiling, thus addressed the sheriff: "This is a sharp medicine, Mr. Sheriff, but it is a physician that will cure all diseases." *State Trials, vol.* 1.

The following supplementary note relates to the 48th page.

Butler's satire against the Royal Society commences in the following strain:

"A learn'd society of late,
The glory of a foreign state,
Agreed, upon a summer's night,
To search the moon by her own light,
To take an invent'ry of all
Her real estate and personal;
And make an actual survey
Of all her lands and how they lay."

The poem then proceeds to state that they pointed a telescope at the moon, and saw two armies engaged in desperate battle; and finally a huge elephant, which was supposed to have taken fright, and broken loose from one of the hostile armies: after several strange speculations upon these phenomena, and their preparing a memoir on the spot for insertion in the transactions of the society, a person present, who was not so deeply infected with this philosophical mania, discovered that the elephant was a mouse which had insinuated itself into the instrument. This threw the assembly into confusion, and finally they agreed to "unmount the tube and open it," when lo! the hostile armies appeared in the shape of

———————"prodigious swarms
Of flies and gnats, like men in arms."

And the poem then concludes,

"But when they had unscrew'd the glass,
To find out where th' impostor was,
And saw the mouse that by mishap
Had made the telescope a trap,
Amaz'd, confounded, and afflicted,
To be so openly convicted,

Immediately they get them gone,
With this discovery alone,
That those who greedily pursue
Things wonderful, instead of true,
That in their speculations choose
To make discoveries strange news,
And nat'ral history a gazette
Of tales stupendous and far fet;
Hold no truth worthy to be known,
That is not huge and overgrown,
And explicate appearances,
Not as they are, but as they please,
In vain strive nature to suborn,
And, for their pains, are paid with scorn."

The famous Cowley, who was one of the earliest members, addressed a complimentary poem to the Royal Society, in the form of a Pindaric ode, which Sprat has prefixed to his History, and which appears to have mitigated his sufferings under the attacks of the hostile wits. Cowley appears to have had the satire of Butler in his eye when he wrote the following lines:

" Mischief and true dishonour fall on those
Who would to laughter or to scorn expose
So virtuous and so noble a design,
So human for its use, for knowledge so divine.
The things which these proud men despise, and call
Impertinent, and vain, and small;
Those smallest things of nature let me know,
Rather than all their greatest actions doe.
Whoever would deposed truth advance
Into the throne usurp'd from it,
Must feel at first the blows of ignorance,
And the sharp points of envious wit.
So when by various turns of the celestial dance,
In many thousand years
A star, so long unknown, appears,

> Though heaven itself more beauteous by it grow,
> It troubles and alarms the world below,
> Does to the wise a star, to fools a meteor, show."

I hope that this specimen of the effusions of two of the most celebrated wits of the age may not be considered as improper.

Dryden was also one of the earliest members of the Royal Society, and was finally excused from paying his arrears probably on account of his straitened circumstances. See *Birch.*

The Royal Society certainly afforded some ground for the ridicule that was cast upon them. Sprat says, "their manner of gathering and dispersing questions is this: First they require some of their particular fellows to examine all treatises and descriptions of the natural and artificial productions of those countries in which they would be informed. At the same time they employ others to discourse with the seamen, travellers, tradesmen, and merchants, who are likely to give them the best light. Out of this united intelligence from men and books they compose a body of questions concerning the observable things of those places." These questions, so framed, were dispersed to their correspondents in different quarters. Thus far the scheme was judicious, and was in general judiciously executed; but some of the questions were calculated to create mirth at the expense of the society. Sprat has published answers returned by a gentleman of Batavia to certain inquiries sent thither. Two of them are as follows:

"Whether in the island of Sambrero, which lyeth northwards of Sumatra, about eight degrees northern latitude, there be found such a vegetable as Master James Lancaster relates to have seen, which grows up to a tree, shrinks down when one offers to pluck it up into the ground, and would quite shrink unless held very hard? And whether the same being forcibly plucked up, hath a worm for its root, diminishing more and more according as the tree groweth in greatness; and as soon as the worm is wholly turned into the tree, rooting in the ground, and so growing great? And whether the same plucked up young, turns, by that time it is dry, into a hard stone, much like to white coral?

"Answer. I cannot meet with any that ever have heard of such a vegetable.

"What ground there may be for that relation concerning horns taking root and growing about Goa?

"Answer. Inquiring about this, a friend laught, and told me it was a jeer put upon the Portuguese, because the women of Goa are counted much given to lechery."

END OF NOTES AND ILLUSTRATIONS.

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TRANSACTIONS

OF THE

LITERARY AND PHILOSOPHICAL SOCIETY

OF

NEW-YORK.

TRANSACTIONS.

No. I.

OF COMETS. *By* HUGH WILLIAMSON, M. D., LL. D., *&c. &c.*

[Read before the Society, 20th June, 1814.]

THE theory of comets, in all ages, has been very obscure. Those bodies were formerly supposed to be portentous, and were deemed to be temporary meteors. It seems, however, to have been generally admitted, within the last two centuries, since telescopes have been greatly improved, that comets are solid bodies, though of little use, revolving round the sun, and suffering from him, at certain times, the most astonishing degree of heat; whence they have been called blazing stars. In the year 1769, during the appearance of a remarkable comet, I ventured an opinion on that subject, very different from the opinions that had commonly been received. I presumed that comets do not suffer a great degree of heat in any part of their revolution. That the tail of a comet is not a flame of fire, but the atmosphere of the comet, thrown behind the nucleus by the rays of light, in its approach towards the sun, and illuminated by the refracted light of the sun. Hence I inferred that comets, in all probability, like this earth, are globes inhabited by rational beings, and little more exposed to excessive heat or cold than we are.

As objections have been published to some allegations contained in that theory, I have reviewed the subject with some attention, since the appearance of a late comet in the year 1811; but no objections have come under my notice by which the conclusions I formerly drew are, in any degree, impaired. True it is, that it has been questioned whether the rays of the sun's light have any force by which they might propel the particles of air. It has also been objected that the theory of heat, which I formerly mentioned, was not correct. The present theory of heat is confessedly very different from that which I formerly adopted; nor shall I pause a minute to consider whether this or that be most correct; since it is not necessary, because it fortunately happens, that the conclusions I attempted to draw do not require the support of a doubtful theory. This I shall endeavour to show by a different course of reasoning.

In order to form correct ideas concerning planets to which we have no access, we are bound to suppose that they agree, in certain prominent characters, with the only planet with which we are well acquainted. From our knowledge, then, of the globe we inhabit, we venture to conclude;

1. That an atmosphere, or air, is essential to animal or vegetable life.

2. That the heat which prevails on the surface of any planet is according to the weight of its atmosphere, and not inversely as the square of its distance from the sun.

3. That all planets, or other bodies revolving round the sun, are provided with an atmosphere that is great in proportion to their several distances from the sun.

4. That the luminous tail of a comet is nothing else than part of its atmosphere thrown to a considerable distance behind the comet, for the relief of the cometarians in their approach towards the sun.

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1. Knowing that air is an essential article in every business of life, we naturally associate the idea of an atmosphere to every planet in which we presume there may be animal or vegetable life. Without the benefit of air, fire cannot burn, vapours cannot ascend; there can neither be rain nor dew; there cannot be any speech, for sounds cannot be propagated; life could not be preserved.

2. If heat came in direct rays from the sun, it would follow, that the quantity of heat on the surface of every planet would be inversely as the square of its distance from the sun, according to a former opinion. But experiments without number prove that such opinion is unfounded. Although light comes from the sun, and light has the power of exciting heat, it is clear that heat does not come from the sun. The experiment is conclusive in all warm climates, and in every climate where there are high mountains. At the foot of the Andes, near the equator, the inhabitants suffer by the heat of eighty or ninety degrees. Let them ascend the mountain, and before they have risen two miles, they find themselves in the region of perpetual snow. How should this happen? They are surely nearer the sun on the mountain than upon the plain, and they are subjected to more of his rays; therefore, according to the alleged rule, they should be warmer; but they are, in fact, much colder, because they are in a thinner, or a lighter, atmosphere. The issue is the same in all cases where the experiment has been made. On the Peak of Teneriffe, the traveller arrives at the region of frost at the very same height, or under the same weight of the atmosphere, that he finds it upon the Andes. If he could rise but two miles farther, it is not to be questioned that he would, in so thin an atmosphere, perish by the want of heat. Hence we infer that the degree of heat, in every planet, is according to the weight of its atmosphere compared with its distance from the sun. We also infer that the inhabitants of the several planets

cannot enjoy the same degree of heat, unless the weight of their atmosphere be increased according to their several distances from the sun.

3. We are now to consider whether the several planets are, in fact, provided with an atmosphere; and whether such atmosphere be proportioned to their several distances from the sun. These inquiries appear the more advisable, because we should with little propriety attempt to prove that comets are habitable, unless we could prove that the planets, with which we are better acquainted, are habitable. We are sufficiently acquainted with the atmosphere of this globe. We know that its weight upon a square foot of the surface is equal to two thousand one hundred and sixty pounds, and that its height does not much exceed fifty miles; at least its density, above that height, is not sufficient to refract the rays of light. Of the other planets we can only say with certainty, that some of them have an atmosphere, but the presumption is strong that they are all provided with the same covering. We are certain that Venus has an atmosphere; for in the year 1769, observing the transit of Venus over the sun, at the Observatory in Philadelphia, her external contact was somewhat obscured, as we afterwards presumed, by her atmosphere; but when half of the planet was on the sun, we discovered a clear circular light round the other half that was off the sun. That light was evidently the rays of the sun refracted by the atmosphere of the planet. Other people in different parts of the world, on the same day, noted similar proofs of the atmosphere of Venus. If Mercury has an atmosphere, considering his very small distance from the sun, his atmosphere should be very thin. It happened that Mercury passed over the sun, on the 9th of November in the same year; and the same persons were appointed to observe his transit. On that occasion the external contact of Mercury with the sun's limb appeared sudden, without any previous obscuration; nor did either of us discover

any indications of an atmosphere. From this it is clear that his atmosphere is very rare, as it should be, according to the above hypothesis.

Mars is the next planet in order, and he is provided with a very considerable weight of atmosphere. When he passes near a fixed star, his atmosphere has been observed to hide the star, although the body of the planet did not interfere. The atmosphere of Mars is computed to be equal to two thirds of his diameter. This implies an atmosphere greatly superior to the atmosphere of this globe, and so it should be, since he is at least forty-nine millions of miles farther from the sun.

Of the atmospheres of Jupiter and Saturn we have little to say with any degree of certainty, their distance being so great. But we observe that the belts, or belt-like appearance of both those planets, exhibit such frequent variations in shape and situation as cannot be accounted for or explained except by the supposition of their having an atmosphere, and that a great one, often suspending large clouds.

We cannot discover any reason why all the planets should thus be provided with atmospheres, unless it was that they might all be habitable; but those planets claim our attention on another account. The axis of every planet, as far as we can discover, is inclined to the plain of its orbit. The effect of such inclination, like that of the earth, is a change of seasons; a change that seems to be calculated to increase the fruits of the soil, for the benefit of man and beast. From the proofs already stated, and this additional circumstance, we infer, without hesitation, that the planets are all inhabited.

I have said nothing concerning the four new planets that have been discovered within the last century. They are small, and their distance is great—between two and three hundred millions of miles. But, from the thick coma with which they are surrounded, it is obvious that they have a weighty atmosphere.

4. Are the comets also habitable? This brings us to consider the circumstances of that luminous appearance called the tail of the comet. Is it a fiery vapour discharged from the comet when ignited by the heat of the sun? Or is it part of the atmosphere of the comet thrown behind the nucleus, as he approaches the sun, lest his inhabitants should suffer by the heat of too great an incumbent atmosphere? The latter appears to be the case, as we shall endeavour to prove.

Perhaps it may be advisable, before we attempt to establish this opinion, to show that the opinion that formerly prevailed cannot possibly be correct. When I speak of comets I shall chiefly refer to that of 1680, because it was very remarkable, and its period supposed to be about five hundred years. That comet came so near the sun that, according to the received opinion of heat being inversely as the square of the distance from the sun, the comet, in perihelio, had acquired a degree of heat that was two thousand times hotter than redhot iron. But it has been computed that a globe of redhot iron, large as this earth, would require fifty thousand years to cool; therefore, if the comet, which was as large as the earth, had cooled slowly as iron, it would have required one hundred millions of years to cool; but though it had cooled two hundred times faster than iron, it would have been five hundred thousand years in cooling. Now it is certain that a comet, heated as above, must have retained a glowing heat, and, like a star, would have been visible to the naked eye, during the whole of its circuit: but we are assured, that the comet referred to disappeared within three months, although it was in a situation where it should have been seen, if luminous. Another fact respecting this very comet demands our attention. On its approach towards the sun, it exhibited a tail some millions of miles long, while it was yet above one hundred millions of miles from the sun. That tail could not have been a flame of fire caused by the heat of the nucleus.

Having thus, as I think, made it perfectly clear that the former theory of comets, which implies their excessive heat, cannot be correct, I shall now try to show that comets are habitable globes. I stated above, that the inhabitants of the several planets seem to be kept warm by the weight of their respective atmospheres, which atmospheres seem to be great or small, according to their greater or less distance from the sun; and the facts stated render it certain that we, on this globe, are indebted to the atmosphere for the heat we enjoy.

Now, according to our theory, as comets wander to a prodigious distance from the sun, (the comet of 1680 is supposed to have travelled to the distance of twelve thousand millions of miles,) they cannot be kept warm, in their aphelion, except by an immense covering. But it has been computed that the atmosphere of that comet, which was as large as the earth, is, at least, six hundred and fifty thousand times greater than the atmosphere of the earth. This, as we presume, would be sufficient for his winter coat.

The chief difficulty that now presents itself, is to show by what means a comet, pressed in its aphelion by an atmosphere some thousands of miles high, can be so relieved, when it approaches the sun, as not to be oppressed by heat. The manner in which the figure of that vast body of air is changed, may be observed by every eye. As the comet approaches the sun, his atmosphere is repelled by the sun, and thrown into a long stream behind its body. That stream, or column of air, which has been taken for a flame of fire, is nothing else than the atmosphere of the comet, illuminated by the light of the sun. The light is refracted by the outer part of the column, so that the whole becomes visible, except a small part at the back of the nucleus. Having referred to the repelling force of the rays of light, I am aware that I have touched the most questionable part of this theory. It is perfectly clear that the repulsion of the cometic atmosphere is from the body of the sun, because the illuminated atmosphere, or tail of the comet, is constantly thrown in opposition to the sun; but it has been questioned whether the comet's atmosphere can be repelled by the rays of light? When I formerly ventured an opinion, that comets are habitable, I availed myself of a theory advanced by Kepler, that the rays of the sun's light have the power of repelling particles of air. To this theory it has been objected, that it cannot be supported by experiments, the test of philosophical reasoning. I have doubts concerning the weight of this objection; because the rays of the sun, collected by a burning glass, are observed, in our gross medium, to move a light body delicately suspended. But if no such experiments had been attempted with success, there are certain conclusions that we are bound to admit from our general knowledge of matter and motion. Thus it must be admitted that every body, having great velocity, and striking against a body at rest, makes some impression on the same. But it is ascertained that the rays of light, coming from the sun, travel more than one hundred and seventy thousand miles in a second of time. Let us now figure to ourselves, a particle of matter, ever so small, and let us multiply its weight into the velocity just mentioned, and this will produce a force to which a particle of air must yield, in a free, celestial space. Now, as the particles of light are generally, as I believe, allowed to be some kind of matter, and as the impetus of all matter, in motion, is according to its velocity, we can easily perceive that the force of the rays of the sun may be sufficient to repel the atmosphere of a comet. According to this theory, the nearer a comet approaches to the sun, the more completely will it be stripped of its atmosphere, except that the attraction of the comet, which is powerful near the nucleus, will necessarily detain some part of its atmosphere. Such, too, is the fact; for the luminous tail increases in length until, in some cases, it extends to sixty or eighty millions of miles. Hence it is that the cometarians, when they approach the

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sun, are not oppressed by the vast weight of their winter clothing. And though, in the day time, they might be rather too warm, even when relieved from the chief part of their ponderous atmosphere, while in their perihelio, they are constantly relieved by a quick circulation of air from behind the nucleus. Their day also is probably very short. This inference is only drawn from analogy; for as no spots have hitherto been observed on the surface of a comet, no means have presented of determining its diurnal revolutions. But of the planets, we observe that those nearest to the sun have commonly the longest day. Venus, at the distance of fifty-nine millions of miles from the sun, turns round her axis in five hundred and eighty-four hours. Mars, at the distance of one hundred and twenty-three millions of miles from the sun, revolves round his axis in twenty-four hours and forty minutes; and Jupiter, at the distance of four hundred and twenty-four millions of miles from the sun, revolves round his axis in nine hours and fifty-six minutes, though he is a great planet.

I have been speaking of light as a body that comes from the sun. The particles, indeed, are very small; but they have figure and size, and they obviously retain their luminous appearance, while they are in motion, else we should not see thousands of other suns, from some of which the light must be hours, weeks, months, or years in coming. But when those particles fall upon this globe, or other solid body, such of them as are not reflected lose, in a short time, their luminous appearance. Hence it is that, in the absence of the moon, we have much more light, one hour after the sun sets, than in the morning, one hour before he rises; by which time the luminous appearance of the particles from the sun is extinguished. It has been objected that if light be a substance coming from the sun, the size of that luminary must decrease. Such is doubtless the case; nor has it been conceived that our system is to be perpetual. The decrement, however, of the sun is very slow, not amounting to a four thousandth part of his bulk, in the space of one thousand years; especially as it is in the constant receipt of light from other luminaries.

Unless arguments shall be adduced, much more conclusive than any thing I have seen, to repel the idea of the sun's light having a certain force, I shall adhere to the original opinion advanced by Kepler. But there are two other powers, either of which, as I conceive, may enable us to account for the repulsion of the cometic atmosphere. I refer to the repulsion that subsists between the particles of air, and a similar property of the electrical fluid.

It is generally believed that the electrical fluid is contained as well in the sun as in every other body within our system; and it is known that the particles of that fluid are highly repellant of one another. The experiment made by two cork balls, suspended near one another, by threads of silk, is familiar to every electrician. Attach short threads of flax to those balls, and electrize the balls; the balls recede from one another, and the threads, repelled by the electrical fluid that is escaping from the balls, fly off at a tangent. After viewing this simple experiment, it is impossible not to perceive, with how much ease the atmosphere of a comet may be repelled by the electrical fluid that proceeds from the sun.

The other power to which I referred, by which the atmosphere of a comet may be driven behind its nucleus, is the repelling power that subsists between particles of air. In this case I take for granted, as the fact seems to be confirmed by observation, that the sun has an atmosphere. We have all observed that the particles of the atmosphere may be forced nearer to one another, but they strongly resist such compression. Hence it is that air, forced into the barrel of a gun, is known to discharge a bullet with deadly effect. Such, too, is the tendency of every particle of air to recede from every other particle, that, according to the allegation of Sir Isaac Newton, a single cubic inch of air, compressed as it is on the surface of the earth, if it should be removed from the earth, so far as not to be affected by the attraction of gravitation, would expand itself, by the repelling power of the several particles, so as to fill a globular space, eighteen hundred millions of miles in diameter. Hence it is clear, that if our atmosphere was not retained by the attraction of gravitation, we should soon be forsaken by it, and perish. Now, if every particle of air is thus repellant of every other particle, it is clear that an immense body of air, compressed by gravitation round the sun, must operate with great force in repelling another body that is attached to a comet, and it is equally clear that it must repel that atmosphere with the greater force the nearer they come together.

If it should be inquired, whether the cometarians, in their aphelion, would not be oppressed by the excessive weight of their atmosphere; and whether they would have sufficient light to pursue their necessary occupations? To such inquiries we reply, that though with us, as above stated, the air presses upon every square foot of a man's body, with a pressure equal to the weight of two thousand one hundred and sixty pounds, we are not oppressed by such weight, because the internal and external pressures are alike. On the subject of light, we know that the pupil of the eye may be so constructed as to fit itself to a very strong, or a very moderate, light. Nor have we any reason to think that the cometarians suffer on that head. Dr. Halley has calculated that the distance of the comet of 1680, was to the earth's distance as one hundred and thirty-eight to one. But Smith, in his Optics, has calculated that the light of the sun is to the light of the full moon as ninety thousand to one. Now if we divide ninety thousand by the square of one hundred and thirty-eight, we shall find that the cometarians, in their aphelion, enjoy a light nearly five times as strong as the light of our full moon; such a light must be quite sufficient.

It being clear that an atmosphere is necessary to vegetable and to animal life, and it being pretty clear, as I think, that every planet and every comet is surrounded by an atmosphere, and that every planet and every comet enjoys as much of an atmosphere, in all situations, as is sufficient to preserve a moderate temperature for all its inhabitants, we are bound to believe that as those globes are obviously fitted to be the habitation of rational creatures, they are certainly inhabited.

What ideas are we to form concerning the rank of the several inhabitants of those globes, in the scale of intellectual beings? On this subject we have only to observe, that if the length of their several lives, or the extent of their intellectual attainments, be at all proportioned to the length of their years, or the magnitude of the globes they inhabit, many of them might regard us with pity. The comets are of various sizes, and their years from seventy-five of ours to five or six hundred. The comet of 1744 was about twenty-seven times the bulk of this globe. The planet Jupiter, whose year is equal to twelve of our years, is more than six hundred times the bulk of this globe.

When we speak of comets wandering to the distance of twelve thousand millions of miles from the sun, it may be objected that at such a distance they would certainly interfere with some other systems. But we are to consider that it appears, from correct observations, that the nearest fixed star must be at a greater distance from us than four hundred thousand times ninety-four millions of miles, which is the distance of the sun from the earth. Thus it appears that a comet must travel at least sixteen hundred times the distance mentioned before it could arrive at the central space between our sun and the nearest luminary of another system. It will follow that light must be above two thousand two hundred days in coming from the nearest fixed star.

Having ventured an opinion that every planet and every comet in our system is inhabited, we have only taken a very imperfect view of the

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astonishing works of the divine architect. There are about three thousand fixed stars visible by the naked eye. Every one of those stars is doubtless a sun, and each of those suns affords light and heat to another system of worlds. Let us only suppose that each of those suns illuminates as many orbs as belongs to our system. We shall state the number at two hundred, though it is believed that twice this number of comets, beside the planets, have already been discovered. This would give three hundred thousand worlds. But three thousand is a small number when compared with the whole number of stars that have been discovered. The relative places of fifty thousand stars have been determined by the help of telescopes. Fifty thousand solar systems, each containing at least one hundred worlds. Five millions of worlds all inhabited by rational beings. How do we seem to dwindle into littleness. How small, how few, are the ephemerons of this little globe, when compared with the countless myriads who inhabit five millions of worlds? All those worlds, and every one of their inhabitants, are under the constant care of the Divine Being. Not one of them is neglected. "Great and marvellous" are his works. How terrible his power!

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No. II.

OBSERVATIONS *on the* LAWS *governing the Communication of* CONTAGIOUS DISEASES, *and the means of arresting their progress.*

By DAVID HOSACK, M. D. *Professor of the Theory and Practice of Physic and Clinical Medicine in the University of the State of New-York, &c.*

[Read before the Society, 9th June, 1814.]

IN July, 1808, I addressed to Dr. Chisholm some observations on contagion, or infection.* The object of that communication was, if possible, to narrow the ground of controversy upon that important and much contested subject. This I endeavoured to do, first, by showing that the distinction which had been proposed by some late writers, between contagion and infection, was unnecessary and fallacious; secondly, by dividing all diseases which are contagious, infectious, or communicable from one person to another, into *different classes*, according to the several laws which appear to govern their communication. These classes are three in number.

The first embracing those diseases which are communicated exclusively by *contact;* as the *itch, syphilis, hydrophobia,* &c. which are never conveyed through the medium of the atmosphere.

The second including those diseases which are communicable both by *contact*, or the near approach to the sick, and by the *atmosphere,* as *measles, small-pox, scarlet fever,* &c. which are communicable in every season of the year, and in every climate; in a pure as well as in an impure air, though more readily by means of the latter than the former, and with which persons are rarely infected more than once in their lives.

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* See Edinburgh Med. and Surg. Journal, vol. 5. p. 247. American Medical and Philosophical Register, vol. 2. p. 14.

Under the third class are enumerated those diseases which are only, in general, communicable, or contagious through the medium of an *impure* atmosphere; the air being rendered thus impure by the decomposition of animal and vegetable substances, as in low, marshy countries; or by concentrated human effluvia, as in camps, jails, hospitals, or on shipboard; but the same diseases I alleged, in a pure air, in large and well ventilated apartments, when the dress of the patient is frequently changed, all excrementitious discharges constantly removed, and attention paid to cleanliness in general, are not usually contagious, or, under such circumstances, are very rarely communicated from one person to another.

In this class I included the *plague*, *dysentery*, *typhus fever*, in its various forms, of jail, ship, hospital, or lake fever, and the *yellow fever*.

I also remarked, that these diseases, like many of the first class, may be repeatedly contracted; but that they are communicable, or otherwise, according to the condition of the air in which they occur, or into which they may be introduced: it was further observed, that the atmosphere thus impregnated by the peculiar virus emanating from the diseased body, becomes *assimilated* to the poison, or ferment introduced, and thereby is rendered capable of reproducing in others the same *specific* disease, whether it be the plague, dysentery, typhus, or yellow fever. Such are the outlines of my first communication to Dr. Chisholm.*

In 1809 Dr. Chisholm did me the honour to reply† to my observations, expressing his entire approbation of the two first classes, but objecting to the third. After enumerating his several objections, he requests me to reconsider my third division, which appears to him to be the only objectionable one. This I have done, and now submit to this society the result of a further examination of this subject, and a detail of the facts by which I have been led to my conclusion relating to the laws of communication, which I have more particularly assigned to the febrile diseases enumerated in the third class.

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* See Note A.

† See American Medical and Philosophical Register, vol. 2. p. 121. See Note B.

In my first communication, I acknowledge I have stated my observations without so full a detail of the facts themselves whence my conclusions were deduced, as perhaps ought to have been exhibited. To the European reader, unacquainted with the peculiarities of yellow fever, more especially as it has appeared in the cities of the United States, my first statement may perhaps appear defective in that evidence which is so justly exacted upon subjects of this nature. This evidence I shall now endeavour to supply, and thereby to confirm the correctness of the classification which has been proposed. Waiving for the present all inquiry relative to the nature or properties of the contagious principle secreted by the diseased body, or the chemical qualities of the atmosphere deemed necessary for its propagation, or the manner in which the contagion diffuses itself, I proceed to observe, that the history of each disease enumerated in the third class, viz. *plague*, *dysentery*, *typhus*, in all its forms, and *yellow fever*, furnishes evidence of the correctness of the remark, that they are governed by a law peculiar to themselves, that they are contagious or communicable in a *foul* atmosphere, but that they are never or very rarely so in a *pure* air, where the sick enjoy the benefits of cleanliness and ventilation.

The same evidence, I trust, will demonstrate another truth, that these diseases are, in no instances, *epidemic*, as they have been improperly denominated by most practical writers, but that their sphere of operation is, with very few exceptions, confined within the limits to which the vitiated atmosphere extends, in which they may be engendered, or into which they may be introduced; and that, in this respect, they differ from ordinary epidemics, "which appear in different and distant parts of the same place, and at the same time."

That the plague, when once generated, whatever may be the sources whence it derives its origin, is communicated by a peculiar virus secreted by the diseased body, will not, I trust, be questioned at this day. Independently of the facts contained in the writings of Thucydides, Lucretius, Mead, Dr. Patrick Russell, and others, showing the contagious nature of the plague, the communication of this disease by inoculation, as performed by Matthias Deggio,* Dr. Whyte,† and the Russian surgeon, noticed by Sonnini,‡ have recently established the fact of its propagation by a specific secretion, beyond all possible controversy.

It has been observed, by Assalini, that Dr. Desgenettes, while in Syria, had in vain endeavoured to inoculate himself with the virus of the plague; and by the same writer it is incorrectly added, that Dr. Desgenettes made the experiment under the persuasion that the disease was not contagious; but from the account of the facts as stated by Dr. Desgenettes himself, it appears that the experiment was not made under that persuasion. On the contrary, he expressly declares, that its contagiousness was demonstrated by *a thousand examples*, and observes, contrary to the opinion of many, that the same person was liable to a second attack of it, as was the case with the convalescents whom he employed to attend upon the sick: furthermore it appears, from his own account, that he inoculated himself with matter taken from a person who had the disease in its mildest form, what he denominates the first degree, in which the fever was slight, and the patient easily and promptly cured. Dr. Desgenettes adds, that it was an imperfect experiment, and that it does not disprove the communication of the disease by contagion, and that he made the experiment for the purpose of quieting the fears of the French troops, and of inspiring them with confidence.*

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* See Med. Com. vol. 8. p. 349. † See Wilson's Expedition to Egypt, and M'Gregor's Sketches. ‡ See Travels into Greece and Turkey, p. 497.

But that the plague, in common with the other diseases I have associated with it, is only communicable through the medium of an impure, or vitiated atmosphere, is an opinion which, although it has never been attended to by physicians, will be found to be verified by every writer on this disease. The plague of Athens, the first of which we have any authentic or satisfactory account, furnishes evidence of this truth. Whether that disease originated in the city of Athens, or was introduced into it from Æthiopia, the fact is established, that the circumstances under which it appeared in that city were peculiarly favourable to its diffusion. It appeared, according to Thucydides, in the beginning of the summer season, and first of all at the Piræus, the port and harbour of Athens, from whence it spread with increasing mortality into the upper part of the city. It appeared, too, at a time when Athens was so crowded with those who had fled thither from the adjacent country of Attica for safety from the invading armies of the Peloponnesians and their allies, that many of them were forced to lodge themselves within the turrets of the walls, or wherever they could find a vacant corner. "The city," says the historian, "was not able to receive so large a conflux of people:" "afterwards the long walls, and a great part of the Piræus, were portioned out to them for little dwellings; at the same time, too, the Athenians were fitting out, at the Piræus, a fleet of one hundred ships to infest Peloponnesus." Even the Pelasgic, a hitherto vacant spot of ground below the citadel, which it was thought profaneness to occupy, and the settlement of which the Pythian oracle had specially prohibited, they were constrained, by urgent necessity, to turn into a dwelling-place. By this influx from the neighbourhood of Athens its number of inhabitants, as stated by a late writer, was suddenly increased from fifty thousand to more than four hundred thousand persons.* In another place Thucydides observes, "Those who had come in from the country had no houses, but dwelled all the summer season in booths, where there was scarcely room to breathe;" he adds, "The pestilence destroyed with the utmost disorder, so that they lay together in heaps, the dying upon the dead, and the dead upon the dying." Even in the public streets some were tumbling one over another, or lay expiring round about every fountain, whither they had crept to assuage their immoderate thirst; the temples, too, in which they had erected tents for their reception, were full of the bodies of those who had expired there. Thucydides proceeds, "In a calamity so outrageously violent, things sacred and holy had quite lost their distinction; all regulations observed before in matters of sepulture were quite confounded, since every one buried wherever he could find a place." He also observes, "it raged the most, and for the longest time, in Athens, but afterwards spread into the other towns, especially in the most populous, but never extended itself to Peloponnesus." We are told by the same historian, that "at the siege of Potidæa, which took place during the same season, the plague followed them even thither, and making grievous havoc among the Athenians, destroyed the army; and that even those soldiers that had been there before, and had, from the beginning of the siege, been in perfect health, caught the infection from the troops brought thither by Agnon. After a stay of forty days, having, in that time, lost one thousand and fifty out of four thousand men, he returned with his ships to Athens."*

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* See Note C.

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* Medical Repository, vol. 1. p. 16.

With these facts before us; the season of the year in which the plague made its first appearance, the part of the city in which it commenced, the multitudes which crowded into it, and those, too, unaccustomed to the air of the town, having been habituated to active employment in the pure air of the country, the impure state of the atmosphere necessarily resulting from this condition of things, combining the evils both of pestilence and war; the disease itself being confined within the walls of the city, while, at the same time, it never extended itself to the neighbouring country, not even to the contiguous towns of Peloponnesus and Bœotia, we are led to the conclusion, that an impure atmosphere is the vehicle or medium by which this disease is propagated.

The circumstances attendant upon the plague, as it has appeared at different periods in the city of Rome, are no less demonstrative of this truth. I will only notice the more remarkable visitation of this disease which took place in the year of Rome 290, and four hundred and sixty-one years before Christ. "This," says Livy, "was a season of great distress; for during this year a pestilential disorder spread itself not only through the city, but over the country, affecting both men and cattle with equal malignity; the violence of the disorder was increased by admitting into the city the cattle and the inhabitants of the country who fled thither for shelter from the enemy's ravages: such a confused collection of animals of every kind suffocated the citizens by the unusual stench, while the country people crowded together in narrow apartments suffered no less from the heat, the want of rest, and their attendance on each other; besides, even contact served to propagate the infection."[*] Baker's Livy.

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* Smith's Translation of Thucydides, vol 1. p. 153.

Dionysius of Halicarnassus mentions[†] that the disease seized studs of mares, herds of oxen, and flocks of goats and sheep, doubtless denoting that this disease was remarkably fatal to those animals when collected in numerous bodies. Orosius, in his account of the same pestilence, observes, "Many of the patricians were victims, but it was most fatal to the poor."[‡] Livy also has a similar observation, that many illustrious persons died, but that among those of inferior note the virulence of the disorder spread its ravages wide.

The history of the pestilence of modern times, the accounts of which are more minutely and satisfactorily detailed, no less proves that this disease, when once introduced, spreads its devastation by means of a vitiated atmosphere, more especially where such vitiation proceeds from confined human effluvia. Accordingly, in the plague of London, in 1665, at which time nearly one hundred thousand persons perished, we are told by Hodges, that while the better sort of people had various resources to avoid the dreadful consequences of this fatal distemper, it was entirely confined to the poor, insomuch that some gave it the name of the *poor's plague.* Lord Clarendon, in the history of his own life, relates that when he and other people of condition, who had fled from the plague, returned to London, they hardly missed one of their friends or acquaintances, the mortality having been confined almost entirely to the lowest orders of the people. "At that time, too, the streets of London," says Thornton, "were narrow, crooked, and incommodious, the buildings chiefly of wood, dark, close, and ill contrived, and by the several stories projecting beyond each other as they rose over the narrow streets, the circulation of the air was almost entirely obstructed. To these inconveniences, he adds, may in some measure be attributed the destruction which had been repeatedly made in the city by the visitation of the plague; for as the air was confined, so the noisome vapours and pestilential atoms were harboured and nourished. Though the destruction of London by the great fire in the succeeding year (1666) occasioned great temporary distress, yet, in the end, it proved of the utmost utility; for, by the rebuilding of the city, and the enlargement of the streets, the free circulation of air was admitted, the offensive vapours expelled, and the city freed from all pestilential disorders."* It is also stated by Dr. Hodges,† that at the breaking out of this plague, the city was unusually full of people: he supposes there must have been upwards of one hundred thousand persons more than usual in the city; and, according to Dr. Baynard, during the progress of this merciless pestilence, there was such a general *calm* and *serenity of weather*, as if both wind and rain had been expelled the kingdom, and that for many weeks together not the least breath of wind could be discovered.

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[*] Grave tempus et forte annus pestilens erat urbi, agrisque, nec hominibus magis, quam pecori; et auxere vim morbi, tenore populationis, pecoribus agrestibusque, in urbem acceptis. Ea colluvio mixtorum omnis generis animantium, et odore insolito urbanos, et agrestem confertum in arcta tecta, æstu ac vigiliis angebat, ministeriaque in vicem ac contagio ipsa vulgabant morbos. Tit. Liv. lib 3. c. 6.

[†] Lib. 10.

[‡] Lib. 2.

It is also worthy of remark, that the city of Oxford, to which the parliament was removed during the prevalence of the disease, remained uninfected; which exemption is ascribed by Dr. Plott to the draining and greater cleanliness of that city.*

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* Thornton's History of London. † De Peste.

The great plague with which Marseilles was visited in 1720, and which destroyed upwards of sixty thousand of its inhabitants, presents us with a detail of facts which leads to the same conclusion. This disease, it is well ascertained, was introduced from the Levant by a ship which arrived at Marseilles from the coast of Syria. It appeared first among the sailors of the suspected ship; it was next taken by the porters engaged in opening and airing the merchandise in the Lazaretto; it was then introduced into the city, and spread among the poor, and first of all in a street which was only occupied by the lower class of people.†

In the commencement of the disease, Bertrand remarks, none but children and poor persons were attacked by it.‡ In a short time it extended to the neighbouring streets; it was also conveyed into the Hotel Dieu, by a person received as a patient from the street where the distemper first broke out; two of the nurses and the matron of that institution first died of the disease, when the infection spread with great mortality, destroying the physicians, surgeons, apothecaries, confessors, and all the other officers and servants of the house, with the whole of the poor in the hospital, including above three hundred foundlings.§

Soon after, all intercourse was prohibited between the town and neighbouring country: the scarcity of provisions which ensued, independently of the crowded state of the city, greatly added to the mor-

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* History of Oxfordshire. † Bertrand's Relation Historique, p. 414. ‡ Ibid. p. 50.
§ Ibid. p. 92.

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tality of the disease: the number of the sick increasing, an hospital was opened for the reception of the infected, where the disease proved fatal to all the attendants. But the disease was not only propagated in those public institutions, where great numbers were crowded together, and in the confined dwellings of the poor; other circumstances occurred which served greatly to diffuse the poison still more generally throughout the city. According to Bertrand, the streets were crowded with "the sick, the dying, and the dead;" and the vapours which arose from the putrid dead bodies, in every part of the city, served to infect the air and spread the contagion; indeed, it soon extended to places that before this had been inaccessible to it; monasteries, and houses shut up in the most exact manner, were no longer places of security; the whole city became more or less *one infirmary*.*

The infection, too, was very much increased from another source not less dangerous. An opinion prevailed that the dogs received the contagion from contact with infected clothes, and thereby became the means of spreading it still more extensively; the consequence was an order to destroy them; in a few days the streets were strewed with their carcasses; a prodigious quantity were thrown into the water; these also were soon cast upon the shore, where, by the action of a hot sun, the air was filled with the most noxious vapours. Infected clothing and furniture were also continually thrown into the street from the windows of the houses in which the disease prevailed, and, if possible, still further to give wings to the poison, fires were injudiciously had recourse to, for the purpose of destroying the infection; "at hours appointed," says Bertrand, "the whole city appeared on fire, and the air became loaded with a thick black smoke, better calculated to retain than to dissipate the contagious vapour."* In fact, these fires, he adds, appeared to relume that of the contagion; "they heated the air, already rendered suffocating by the heat of the season and climate; the pestilential poison became more active, and the disease acquired new force."†

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* Bertrand, p. 145.

The plague of Aleppo, in 1760, 1761, and 1762, might also be cited upon this occasion, as well as many others, both anterior and subsequent to that period, to show that the epidemic influence of this disease is chiefly dependent upon the atmosphere into which it may be introduced. I cannot, however, pass over, without comment, the plague which the British and French troops suffered during the celebrated expedition to Egypt in 1800 and 1801, inasmuch as it will show that this disease, even in its *native* climate, is governed by the same laws of communication which have been observed when it has been introduced into other countries.

We are accordingly told, by the learned Dr. Wittman,‡ "that the disease is more prevalent at Rosetta than in any other town, or part of Egypt; he adds, "the streets of Rosetta are extremely narrow and very dirty. The crowded manner in which the inhabitants live together would appear sufficient, in a stagnant state of the atmosphere, in most of their towns, to generate pestilential or malignant diseases. The very few comforts and conveniences which fall to the lot of the poorer class of the natives in Egypt, by far the most numerous, would lead one naturally to expect great mortality when the plague prevails among them. Dreadful examples are seen annually to happen." In another part of the same work, he is still more explicit on this point, showing that the plague "does not always possess the same activity and force;" and the necessity, as he expresses it, of some "*powerful agent to put the contagion into action, and to give it its full force.*" He then asks,

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* Bertrand, p. 74. † Ibid. p. 75. ‡ Travels in Egypt, p. 525.

"May this agent reside in the atmosphere? Does this peculiar constitution of the air consist in a superabundance, or diminution, of the ordinary proportion of oxygen in the atmosphere? or in the combination of some peculiar gas or gases diffused in it?" He suggests that a series of eudiometrical and other observations, continued for several years, might throw some light on this subject: "Time alone," he adds, "may unfold this mystery."* But when we take into view the facts he has already stated, relative to Rosetta, and are told by the same author, that in Egypt the plague prevails when the Nile is low, and of course the air loaded with the impurities thence arising; that at Constantinople, the cold weather, in winter, puts a period to its progress, and the still more general observation, that the extremes both of heat and cold, are unfavourable to the propagation of plague; these facts, in connexion with those already stated of this disease, as it has appeared at different times, and in different parts of the world, are certainly calculated to dissipate much of the mystery in which this subject has been enveloped. The remarks of Dr. M'Gregor, that the plague varies its type according to the state of the air, and other circumstances, and that by *ventilation, fumigation,* and attention to *cleanliness,* the progress of the disease was arrested,† also serve to confirm the correctness of the view which has been taken of this subject. Even the writings of Assalini, who disbelieves the communication of this disease by contagion, furnish additional support to the principle here contended for; for he admits, that when persons are *shut up* and *crowded together,* in infected places, the disease is readily contracted.‡ In another place, he observes, "that if a person be exposed to breathe the infected air in the chamber of a patient, or should he stay too long in the same atmosphere, he will run a great risk of contracting the prevailing malady."* He moreover proceeds; in order to prevent all suspicion, and avoid all danger of carrying the disease where it has not been before, that they should take nothing with them but the necessaries of life; they should avoid, as much as possible, halting in villages; and each time when they happen to encamp, they should expose their baggage and clothes to the air, which would not fail of dispersing every particle of contagion. As a further evidence, too, of the connexion between the prevalence of the disease and the state of the air, he remarks, that during the epidemic, "the inhabitants residing near the sea were more exposed than those who were at some distance, and that there were several villages situated on the heights which had not even a single sick person." In many other parts of his work, he shows that his mind was not totally devested of belief in the communication of the plague, by contagion; and when danger approaches, like some modern professors in religion, he proves himself to be the practical infidel, by distrusting even his own doctrines; for he takes great pains to inform us of the various means he made use of to protect himself against the disease, and which are both as efficient and judicious as the most sturdy contagionist could possibly have employed. Imlac, in Rasselas, speaking of the appearance of departed spirits, says, "Some who deny it with their tongues, confess it by their fears." So with Assalini, and, indeed, the same may be said of many others who *affect* to disbelieve the doctrine of contagion.

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* Travels in Egypt, p. 533. † Med. Sketches, p. 111. ‡ Observations sur la Peste.

In addition to the details cited from Thucydides, Livy, and from the writers of modern times, I might here introduce similar facts recorded of the plague of Florence, which appeared in that city in 1348.†

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* Observations, &c.

† See Introduction to Boccacio's Decameron.

But to conclude upon this part of the subject, and in the language of Dr. Chisholm himself, "Every physician who has delivered his opinion of the origin of the plague maintains, that a peculiar state of the air is absolutely necessary to establish the powers of contagion, and give circulation to the imported infection."*

Another disease which I have placed in the same class with the plague, and have considered as governed by the same laws of communication, is *dysentery*. By this disease I mean not that *local* affection of the bowels which is frequently symptomatic of diarrhoea, and unaccompanied with fever, but that form of it which has been described by Pringle, Blane, and other practical writers, under the title of epidemic dysentery, or the dysentery of camps.

This disease, like the plague, appears also to derive much of its infectious character from the condition of the atmosphere in which it takes place: in pure air, where cleanliness and ventilation are attended to, it rarely extends beyond the individual in whom it first originates; but in a vitiated atmosphere, loaded with moisture, marsh effluvia, or the perspirable matter, and other excretions of the human body, especially where many persons are crowded together and in small apartments, dysentery communicates itself to the greater part of those who may be exposed to its influence. Zimmerman remarks, that "in general it appears to him that dysentery became contagious purely through nastiness and the crowding many people together in a small space, but was by no means so of itself."†

And as a further evidence that the disease was derived not from the noxious qualities of the atmosphere alone, but from contagion communicated through that vitiated medium, he also observes of the dysentery which occurred at Dettingen, in 1743, that such of the officers, among whom it was not so general as among the soldiers, as had lain wet at Dettingen were first attacked by it; the rest received it by contagion; but a regiment that had not lain in the damp, nor been exposed to the rain, remained perfectly free from it, at a small distance from the camp; though, excepting that they were not subject to the contagious effluvia of the rest, "they breathed the same air, ate the same provisions, and drank the same water."[*] And in the hospital in the village of Feckenheim, about a league from the camp, the dysentery being introduced, "the air became infected to such a degree that not only the rest of the patients, but even the apothecary, nurses, and the other servants, with most of the inhabitants of the village, were infected."[†]

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* Essay on the Malignant Pestilential Fever, vol. 1. p. 280.

† Zimmerman on Dysentery, p. 20.

Dr. Donald Munro, who, as an army physician, had frequent opportunities of observing the character and progress of dysentery, ascribes the greater violence of this disease to obstructed perspiration, moist and putrid vapours, the putrid steams of dead horses, of the privies, excrements not covered with earth, or to the unwholesome, moist, putrescent vapours of marshy or wet grounds, or pools of stagnating water acted upon by the heat of summer, and of other corrupted animal or vegetable substances, all which served to increase the infection. Hence he observes that in camps the more hot and rainy the season, the more wet and marshy the ground, and the more the air is replete with putrid vapours, the more frequent and the more fatal is the dysentery.[‡]

The remarks of Sir John Pringle are also in point on this subject. "Some dysenteries," he observes, "appear upon first taking the field, but the cases are never so bad nor nearly so frequent, as towards the end of summer; they then become epidemic and contagious. They have always been most numerous and worst after hot and close summers, especially in fixed camps, or when the men lay wet after a march in warm weather."* "In general the contagion does not suddenly spread; for whole towns and camps are never seized at once from the impurities of the atmosphere; but the infection is carried from one to another by the effluvia, or clothes and bedding, &c. as in the plague." "In camps the contagion passes from one who is ill to his companions in the same tent, and from thence, perhaps, to the next." "The foul straw," he adds, "becomes infectious, but the greatest sources of infection are the privies, after they have received the dysenteric excrements of those who first sicken. The hospitals likewise spread it, since those who were admitted with the flux not only gave it to the rest of the patients, but to the nurses and other attendants of the sick."† And to show that this disease is not dependent on a general constitution of the atmosphere, but upon that which is impure, and to which the dysenteric taint has been communicated, he observes of the epidemic which raged at Nimeguen, in 1736, "that none of the neighbouring towns suffered, unless by their communication with the place infected."‡ Similar facts, illustrative of the rapid extension of this disease, when introduced into ships of war, are recorded by Dr. Blane, in his valuable work on the Diseases of Seamen.

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[*] Zimmerman on Dysentery, p. 26.

[†] Ibid. 139.

[‡] Diseases of the Army, v. 1. p. 314—316.

That the contagiousness of *typhus fever* is, also, in a great degree, ascribable to a similar condition of atmosphere as its pabulum, is demonstrated by facts recorded in almost every book of practice, more especially in those relating to the diseases of the army and navy, which have ever been found to be nurseries of this disease. The observations made upon this subject by the Linds, Pringle, Blane, Percival, Smyth, Trotter, Haygarth, Ferriar, Currie, and others, relating to the spread of this disease, when introduced into hospitals and ships of war; its prevalence and diffusion among the poor of London, Edinburgh, Liverpool, and the manufacturing towns of Great Britain; the beneficial effects which have been derived from the establishment of fever wards, and houses of recovery, the advantages which have been experienced from the fumigating or oxygenating processes introduced by Dr. Johnstone of Worcester, Guyton De Morveau, and Carmichael Smyth, in arresting the progress of the typhus fever, all irresistibly lead to the conclusion, that the impurities of the air constitute the fuel of this disease; and, to use the expressive language of Dr. Ferriar of Manchester, in a late communication which I have received from that learned physician, that "dilution with atmospheric air is now ascertained to be the most effectual mean of destroying contagion, and of controlling the ravages of this disease."*

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* Diseases of the Army, p. 218. ed. 7th.

† Ibid. 254.

‡ Ibid. 252.

Were it necessary, I might adduce a volume of additional testimony on this subject. I cannot, however, omit the following pertinent remark of Dr. Haygarth, who, like another Howard, has devoted his life to the investigation of this interesting subject; and to whom Great Britain is indebted for the first establishment of institutions specially devoted to the important purpose of arresting the progress of contagious diseases. In his remarks on the nature of the contagion which produces putrid fevers, he observes, "I soon discovered that their infectious atmosphere was limited to much narrower extent than even the small pox. So manifestly I observed this to be the case, that in a clean, well-aired room, of a moderate size, the contagious poison is so much diluted with fresh air, that it very rarely produces the distemper, even in nurses exposed to all the putrid miasms of the breath, perspiration, fæces, &c. whereas, in the close, dirty, and small rooms of the poor, the whole family, generally, caught the fever. Hence we may conclude, that in well-aired and clean apartments, the air is seldom so fully impregnated with the poison as to acquire an infectious quality."*

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* See American Med. and Phil. Register, vol. 2.

The observations of the late Dr. Willan are also in point on this subject. "Formerly," says that accurate observer, "the typhus, with petechiæ, &c. often occurred in our prisons, and proved fatal to those who were under confinement in close cells, or who lodged in crowded apartments. Mr. Box, surgeon of Newgate, informs me that the fever has been rendered less frequent there, and less virulent, by removing the persons first affected, into airy rooms, or wards, and by a general attention to ventilation, cleanliness, &c. so that, at present, petechiæ do not appear in more than one case in thirty."† And of three hundred and seventy-nine patients committed into the London House of Recovery, says Dr. T. Bateman, nine only, or about one in forty-two, were affected with petechiæ.‡

The facts which have been ascertained relative to the communication of *yellow fever*, furnish no less conclusive evidence that this disease, like those already noticed, is, or is not, generally contagious, depending on the qualities of the air to which it may be communicated. The history of every visitation of this disease, in the United States, establishes this truth. It has not only regularly made its first appearance in our sea-port towns, and in those places where the air is most impure; at that season of the year, and in those seasons when such impurities acquire their greatest virulence; in those houses which are most crowded with inhabitants, and where there is the least attention paid to cleanliness; but, wherever the same disease has been thence conveyed to other parts of the same city, or town, or into the country, it either was propagated or extinguished, according to the *local* circumstances of the place to which it was so conveyed.

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* Proceedings of the Board of Health in Manchester.—Letter from Dr. Haygarth to Dr. Percival, p. 8.

† Willan on Cutaneous Diseases, p. 469.

‡ Ibid.

Dr. Lining, in his description of the yellow fever which was introduced into the city of Charleston in 1732, 1739, 1745, and in 1748, observes, that, although the infection was spread with great celerity through the town, yet, if any from the country received it in town, and sickened on their return home, the infection spread no further, not even so much as to one in the same house. He remarks, that the disease was generally more fatal to those who lay in small chambers not conveniently situated for the admission of fresh air.* The yellow fever with which the city of New-York was visited in 1791, and which was introduced by a vessel from the West Indies, and rendered memorable by the death of one of our most respected citizens, General Malcolm, who was the first victim to the epidemic of that season, is thus recorded by Dr. Jonas Addoms, in his excellent dissertation on that disease:

"About the middle of August, 1791, a contagious fever appeared in the city of New-York, which first discovered itself near Peck-slip, a part of the city thickly inhabited, its houses generally small, and badly ventilated; many of the inhabitants were in indigent circumstances, which is a frequent cause of the want of cleanliness. Here it raged a considerable time; it then began to spread, as some attendants on the sick became infected who lived in other neighbourhoods. By this means it was carried to other families, and most generally could be traced to this source. It likewise proved more particularly fatal near the place where it first appeared, than in any other part. Thus at length it spread through the city, until about the middle of October, when the weather growing a little cooler, the disease greatly abated, and in a short time disappeared."*

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* Edin. Phys. and Lit. Essay, vol. 2. p. 408. 427.

Dr. Addoms, the author of that dissertation, since that time resided many years in St. Croix, and being associated with a celebrated physician of that island, the late Dr. Gordon, had ample opportunities of seeing the yellow fever in all its forms. During his last visit to this city, not long before his death, he informed me that the disease which he had seen in New-York in 1791, was precisely the same which he afterwards saw in St. Croix, and which frequently prevailed during his residence there, more especially among Europeans newly arrived within the tropics. He also remarked, at the same time, that this disease always acquired new virulence, and was rendered highly contagious, when introduced among soldiers crowded in barracks, or on shipboard.

In the yellow fever of 1793, which was introduced into the city of Philadelphia from the West Indies, it is conceded, on all sides, that the disease made its first appearance in Water-street, and that all the cases of this fever were, for two or three weeks, evidently traced to that particular spot. It is also a fact well ascertained, that in the vicinity of the place where the infection was first received, the air was, at the same time, in a very offensive condition from a quantity of damaged coffee which was exposed upon the dock, and under circumstances favourable to its putrefaction and exhalation. From that place the disease gradually infected a considerable part of the city, the Northern Liberties, and district of Southwark, and did not subside until terminated by frost, after having been fatal to nearly five thousand persons.

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* Inaugural Dissertation on Yellow Fever, p. 7.

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It is also to be remarked, that its ravages were chiefly confined to the poor, and to those parts of the city where the houses were small, and the least attention given to cleanliness and ventilation. In the language of Mr. Carey, "it was dreadfully destructive among the poor. It is very probable that at least seven eighths of the number of the dead were of that class; the inhabitants of dirty houses have severely expiated their neglect of cleanliness and decency by the number of them that have fallen sacrifices. Whole families, in such houses, have sunk into one silent, undistinguishing grave. The mortality in confined streets, small alleys, and close houses, debarred the free circulation of air, has exceeded, in a great proportion, that in the large streets, and well-aired houses. In some of the alleys a third or fourth of the whole of the inhabitants are no more. The streets in the suburbs that had the benefit of the country air have suffered little. It is to be particularly remarked that, in general, the more remote the streets were from Water-street, the less of the calamity they experienced."*

"Though the disease," says Dr. William Currie, "was highly contagious, the influence of the contagion was circumscribed to a narrow sphere."†

As a further evidence that it did not depend on a general condition of atmosphere, the same author remarks, "that while this formidable disease was making such ravages in the city, the country, for some miles around, was never more healthy."‡ In another work Dr. Currie has very explicitly admitted the *qualified* contagiousness of yellow fever, observing, "that it is only contagious in situations where the air is confined, and the exhalations of the sick are permitted to accumulate,

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* Carey's Account, 4th edit. p. 61, 62.

† Treatise on the Synochus Icteroides, p. 8.

‡ Ibid. p. 11.

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through neglect of frequently changing the bed and body linen of the patient."[*]

Similar facts are recorded of the visitation which New-York experienced of the same disease in 1795. Upon another occasion I shall make public the evidence which is in my possession, indisputably proving the importation of the yellow fever of that season from Port-au-Prince. In that year the disease appeared upon the east side of the city, first affecting some seamen who had received the infection from a brig directly from Port-au-Prince; from thence it spread in the vicinity from Dover-street to Peck-slip; but throughout that season it was confined, in a great degree, to that part of the town where the local condition of the atmosphere was peculiarly favourable to its diffusion; for not only an unusual quantity of filth was accumulated in Peck-slip, but at that very time a great number of emigrant poor had arrived from England, Ireland, and Scotland, so that the numerous lodging houses, especially in that neighbourhood, were unusually crowded; add to this, that the weather was uncommonly moist, and thereby peculiarly calculated to spread the infection. According to the statement made by Dr. Bayley, it was particularly fatal to the emigrants of that very summer; for "out of nearly eight hundred persons who died," he observes, "not more than one hundred and fifty were citizens of New-York."[†]

In another part of the same statement he remarks; "so limited was the operation of the contagion that the number of those taken sick in low situations, compared with those residing in more elevated parts of the city, may be computed as twenty to one."[‡]

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[*] See Observations on the Yellow Fever, in the Philadelphia Med. and Phys. Journal, vol. 2. part. 1.

[†] See Bayley on the Epidemic of 1795, p. 90.

[‡] Ibid. p. 80.—See also Letters to Dr. Buel by E. H. Smith.

In 1798 New-York was again visited with this scourge of our seaport towns: during the months of August, September, and October, about two thousand persons fell victims to this disease, at the end of which time a keen frost put an almost instantaneous termination to its progress. The disease of that season first appeared at the shipyards, in the neighbourhood of New-slip, and, as in former years, was introduced from the West Indies.* After cutting off several persons in the neighbourhood in which it commenced, the same vessel was removed to another slip, also on the east side of the city; from thence the disease was communicated by those who worked on board to a thickly-settled part of the city, where the houses are small, the streets narrow, and chiefly occupied by the poor; viz. Cliff-street, John-street, Ann-street, Fair-street, Eden's-alley, and Rider-street; at the same time, however, it still continued to extend its ravages in the vicinity of the place to which the poison had been first communicated; and to some other thickly-settled parts of the town, to which it was subsequently conveyed. In a short time afterwards it was introduced into Pearl-street, and in that part of it between Burling and Peck slips, where it spread very extensively. In that season a number of circumstances concurred to diffuse the contagion in that part of the city: a great quantity of rain had fallen, so as to overflow the cellars in Pearl-street, which were, at the same time, stored with salted provisions; these were soon afterwards spoiled, and loaded the atmosphere with a highly offensive vapour; the disease raging at that time in that neighbourhood, acquired new virulence, and, for the most part, followed the course of the vitiated atmosphere; "beyond the limits of which," says Mr. Webster, "the disease exhibited

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* See statement of facts on this subject by the Rev. Dr. M'Knight, in the Amer. Med. and Phil. Reg. vol. 3.

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little infection:" indeed, the extension of this disease, as has already been frequently observed, was so circumscribed within the limits of this impure air that it became very generally believed that, in that season, whatever may have been the case in former years, the disease exclusively arose from those domestic sources, more especially from the putrid provisions. But that the yellow fever of that season did not derive its origin from the spoiled beef is evident, not only from the fact that the disease had already previously appeared in other parts of the town, and even in that very neighbourhood, before those heavy rains had fallen, and their pernicious effects were perceived; but also, that those tainted provisions, unaccompanied with the specific poison of the disease, did not of themselves communicate infection to those who were constantly exposed to their effluvia.

Mr. Edmund Prior, the inspector-general of beef at that time, informed me, that of forty persons whom he had employed in examining the beef, and in removing and emptying such barrels as were found in a putrid state, not one was taken ill of the yellow fever.* But Dr. Chisholm and Dr. Stewart have abundantly shown, that decomposed animal or vegetable matters will not, of themselves, produce the pestilence;† and that this disease is generated in the human system, and communicated from one person to another, by a peculiar secretion from the morbid body. My object is to show that when such virus is introduced into a certain state of atmosphere, the disease is readily contracted, but that beyond that atmosphere it is rarely infectious.

Although the diseases which have been noticed are rarely communicable in pure air, and are not generally contagious in the country, it is not less true, that in some few instances it appears, either that the virus, as secreted from the diseased body, is alone, in sufficient quantity, or possesses a sufficient degree of virulence, to reproduce such diseases; or, that by means of the impurities collected about the diseased individual, occasioned by inattention to cleanliness and change of clothing, the retention of his excretions, or the confined air of his apartment, the virus itself becomes multiplied, and thereby the means of communicating the disease from one to another are in the same degree increased: for it is a fact not to be questioned, that instances of yellow fever, as well as of the plague, dysentery, and typhus fever, have been occasionally infectious, even in the more pure air of the country, though it must be acknowledged that such cases are of rare occurrence.

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* See Note D.

† See Note E.

It is observed by Dr. Rush, whose records of the several visitations of the yellow fever in the city of Philadelphia will be lasting monuments of the facts which they contain, as well as of the impressive and eloquent manner in which they are related, "that out of upwards of one thousand persons who have carried this disease into the country from our cities, there are not more than three or four instances to be met with of its having been propagated by contagion."* Such instances, however, have occurred in New Hampshire, as related by Dr. Spalding;† in Connecticut, as stated by Dr. William Moore of this city;‡ on Staten-Island, in 1798, as recorded by Dr. R. C. Moore;§ at Huntingdon, on Long Island, in 1795 and 1798;‖ and at Germantown, in the vicinity of Philadelphia, as related by Dr. Wistar.¶ But these very exceptions, if they can with propriety be denominated exceptions,

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* Observations on the Origin of the Yellow Fever of 1799, p. 12.

† Med. Repos. vol. 3. p. 8. ‡ Addoms' Disser. p. 7. American Med. and Phil. Reg. vol. 2. p. 177. § Ibid. vol. 2. p. 22. ‖ Ibid. vol. 3. p. 191.

¶ Additional Facts and Observations by the College of Physicians of Philadelphia, p. 36.—See Note F.

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manifestly prove the specific character of those diseases, and that they are propagated by a specific secretion peculiar to each disease, whether it be plague, dysentery, typhus, or yellow fever. Indeed, to use the emphatic expression of the Edinburgh Reviewers on this subject, "In the present state of medical knowledge, it would not be at all more absurd to deny the existence of fever altogether, than to maintain that it is not propagated by contagion."* But, in the language which Dr. Mead has applied to the plague, we may say of all the diseases of this class, "that a corrupted state of the air is, without doubt, necessary to give these contagious atoms their full force."†

If it were necessary I might go on to cite every return of the yellow fever with which the United States have been visited to show, that the progress of the pestilential poison has ever been commensurate with the impurities of the atmosphere, and that when sufficiently diluted with pure air, it ceases to propagate itself.

It is probably owing to this impure condition of the atmosphere that the various fevers, and the greater mortality of diseases in general, are to be ascribed, which physicians have frequently observed to precede the appearance of pestilential disorders, and to announce their approach, and which have led many to conclude that the pestilence itself was thus engendered by local circumstances, and not imported. Facts of this nature have served to mislead the editors of the Medical Repository, and many other late writers, who thus confound the *exciting* and *predisposing* causes of disease; who do not discriminate between the inflammable materials, and the spark which lights the flame; but have identified the domestic circumstances which have served to diffuse the poison of yellow fever, with the peculiar virus itself, by which that disease has been introduced into the various cities of the United States.

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* Edinburgh Review, vol. 1. p. 246.

† Mead's Medical Works.

The same local circumstances, I believe, will go far in accounting for the "pestilential state of the air," the "secret constitution of atmosphere," so often recorded by writers on epidemics; at the same time that they teach us that the diseases now under consideration are only epidemic in as far as the vitiated state of the air is itself epidemic.

I, however, wish it to be understood, that I do not exclude the influence of bodily predisposition, the passions of the mind, and many other circumstances, in aiding the propagation of pestilential diseases.

Having, as I trust, shown, by the facts that have been adduced, that the plague, dysentery, typhus, and yellow fever, constituting the third class of contagious diseases, require an impure state of the air to diffuse and multiply them, the question next presents itself, in what manner does such impure air operate in spreading those diseases? Upon this part of the subject I have the misfortune to differ from Dr. Chisholm no less than I do as to the necessity of such an atmosphere to propagate the peculiar poison of each of those diseases. Dr. Chisholm observes, that if the proposition had been advanced, "that those diseases, particularly the pestilential yellow fever, are rendered more violent in their action under the circumstances stated, of an impure atmosphere, that no possible objection could be made to it, inasmuch as it is supported and proved by all experience;" and he proceeds to express the opinion that such an atmosphere may have an effect "by rendering the system of the healthy person, who receives the poison from the sick, more susceptible at the moment of its introduction, of its peculiar action;" but that this multiplying power does not proceed from any action of the air upon the peculiar virus of those diseases; that "it does not proceed from the impure atmosphere becoming assimilated to the poison introduced.

That air, deprived of its due proportion of oxygen, and loaded with mephitic materials, especially the confined excretions of the human body, will vitiate the mass of circulating fluids, and impair the functions of the nervous system, cannot be denied; that the febrile diseases with which the system may be affected while in this state, will acquire an extraordinary degree of malignancy, will also be readily conceded; but that such condition, either of the atmosphere, or of the human system, increases its susceptibility to be acted upon by the virus of those contagious diseases, composing the third class, does not correspond either with the facts which have fallen under my own observation, or with those I have been enabled to obtain from the writings and observations of others.

The well known facts relative to the communication of *jail fever* to the judges presiding at the Black Assizes, in 1577,* and a similar infection being communicated to the judges on the bench, and other persons present, at the sessions held at the Old Bailey, in 1750, while the prisoners themselves remained in health, insensible to infection, furnish incontestible evidence of the effects of habit in diminishing the sensibility to the poison of fever: and with regard to the *yellow fever*, it assuredly has not been the case in the United States, that those who were most accustomed to the impure air of the place in which the disease prevailed, were more susceptible of the disorder than those who had recently arrived from the pure air of the country, or from the more elevated parts of the town. On the contrary, those who were least accustomed to the impure air of the city, or of the infected spot, were uniformly observed to be most susceptible of the contagion. Those, too, who enjoyed the most vigorous health, and the most robust constitutions, the reverse of that condition of body which would be the effect of a residence in impure air, were more readily infected upon coming into the atmosphere impregnated with the contagion, than those who had remained constantly exposed to its influence. Whatever differences of opinion have existed among the physicians of the United States, as to the origin of the disease, they are all perfectly agreed relative to the facts which I have just stated. Indeed, Dr. Chisholm himself inadvertently admits the same to be true; for he observes, that in the West Indies, sailors, soldiers, and young men, especially those who have recently arrived from Europe, and are least accustomed to the climate, were more obnoxious to it than others.*

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* Bacon's Works, vol. 2. Stowe's Chronicle.—See Note G.

Dr. Gordon, and, indeed, all the most distinguished practical writers on this subject, concur in the same observation. "New comers," says Dr. Gordon, in the appendix to Dr. Chisholm's late valuable letter to Dr. Haygarth, "were infected with the pestilential fever, while the old seasoned soldiers had only the common tropical remittents; and this was universally the case whenever both diseases were at the same time epidemic."† A similar, and still more general, observation on the predisposition of those who are unaccustomed to impure air, is made by Dr. Blane. "Infection," says he, "like some other poisons, does not so readily affect those who are accustomed to it, and therefore those who are in the habit of being exposed to it, frequently escape its bad effects." For the like reason, he adds, "physicians and nurses are less susceptible than others; and strangers, who are accustomed to a pure air, are the most susceptible of any."* With these facts and observations before us, we are compelled to conclude, that the impure air necessary to propagate the contagion does not operate in the manner Dr. Chisholm supposes, by "increasing the susceptibility of the system to the action of the poison introduced." On the contrary, I believe that it produces its effects by some chemical combination with the peculiar virus secreted from the diseased body, and that thereby the contagion becomes more or less extensively multiplied, according to the extent and virulence of such vitiated atmosphere.

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* Chisholm's Letter to Haygarth, p. 182, &c.

† Ibid. 220.

I shall not attempt to define the precise nature of the chemical union which takes place under such circumstances. But I wish it to be distinctly understood, that in such combination, I do not believe with those writers who contend that a *tertium quid* is produced, or, as Dr. Adams of London, in his late publication on Epidemics, has reiterated the same idea, "that a new kind of air is generated."† On the contrary, as far as I am enabled to view the subject in connexion with the facts usually observed during the prevalence of the diseases which have been noticed, I am inclined to believe, that in this combination the peculiar virus of those diseases is in no way changed, but multiplied; and that this multiplying power is a process very analogous to that which we observe to take place in the assimilation of the fluids of the human body to the peculiar taint which may be introduced into the system, as, for instance, in small pox and syphilis; or, perhaps, that it more nearly resembles the process of fermentation, as it occurs in inanimate matter. By both these processes such an assimilation takes place in the fluids acted upon, whether of the living body or in dead matter, that they partake of the same properties with the virus or ferment introduced, and are thereby rendered capable of renewing the same process in other bodies under similar circumstances. This process has very properly been denominated by Dr. Walker, the *assimilating fermentation*,[*] and has been no less successfully employed both by him and by Mr. Cruikshank,[†] as well as by Dr. Cullen, to explain the changes which take place in the living system, acted upon by small pox, and the virus of other contagious diseases, than it has been by Sir J. Pringle,[‡] Macbride,[§] and Alexander,[‖] to the phenomena of fermentation, as it occurs out of the body.[¶] The history of plague, dysentery, and typhus fever, as well as the recent observations in animal chemistry, furnish a variety of facts which may be adduced in illustration of such fermentative process taking place in the atmosphere, and in watery fluids loaded with the excretions of the human body, or the vapours of vegetable and animal substances in a state of putrefaction.

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* Diseases of Seamen, p. 223.

† Adams on Epidemics, p. 11.

Similar facts, illustrative of the fermentative process contended for, have been observed whenever the yellow fever has prevailed in any of the cities or towns of the United States. I have already stated that this disease has always prevailed in proportion to the presence of such fermentable materials. It is no less true, that whenever the disease has been introduced it has spread in the greatest degree in those seasons when the air was unusually moist: this was remarkably the case in New-York, in 1795[**] and 1798,[††] and in Philadelphia, in 1793 and 1798:[‡‡] and that the yellow fever has prevailed in the United States in those seasons when the heat, combined with moisture, was most favourable to such assimilating or fermentative process is also proverbially true. It is also to be observed, as universally admitted, that the same disease has uniformly been extinguished by the approach of frost, which destroys such fermentative process.

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[*] Walker's Inquiry into the Small pox.

[†] Anatomy of the Absorbing Vessels.

[‡] Diseases of the Army, Appendix.

[§] Experimental Essays.

[‖] Experimental Essays and Experimental Inquiry.

[¶] See Note H.

[**] See Bayley on the Yellow Fever of 1795.

[††] Hardie on the Yellow Fever of 1798.

[‡‡] See Rush and Currie.

Another argument in favour of this explanation is derived from the fact that this disease has, in several instances, been introduced into our cities, without extending beyond the individuals who have introduced it; manifestly owing to the active exertions of a vigilant police, at the same time that every attention was paid in preserving cleanliness about the persons of the sick. This was remarkably the case in the year 1804, when the yellow fever was introduced at the Wallabout, on Long Island, and in 1809, when the same disease prevailed at Brooklyn. In each of those years the fever was introduced into this city by persons who had received the infection on Long Island, but, owing to the circumstances just mentioned, it was not communicated to others; while the same disorder, owing to local circumstances, spread in the vicinity of those places on Long Island where it had first appeared.*

During the year 1811, the yellow fever was also introduced into the city of Amboy, New-Jersey, from the Havanna, but did not spread beyond those persons who were first attacked in consequence of their immediate exposure to the air of the infected vessel. The local circumstances of Amboy, its elevated situation, its dry and sandy soil, its wide streets and spacious houses, their distance from each other, and the remarkable cleanliness of the town, most satisfactorily account for the sudden extinction of the disease, while the evidence of its importation must be admitted to be conclusive.†

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* American Med. and Phil. Reg. vol. 2. p. 95, &c.

† See American Med. and Phil. Reg. vol. 3.; also Edinburgh Med. and Surg. Journal, and the Med. and Phys. Journal of London.—See Note I.

But there is another circumstance which particularly merits attention: in every epidemic visitation of the yellow fever, several days, viz. from eight to twelve, or fourteen, have generally elapsed between the first cases that appeared, and the communication of it to other persons, even in the same neighbourhood; insomuch that not only our citizens, but our physicians themselves, have been led to doubt the existence of the disease, and to stigmatize as alarmists those who first announced the deadly visiter.* I can never forget the occasion, in 1795, when that venerable and experienced physician, the late Dr. John Bard, assembled the physicians of this city to announce to them the first cases of this disease which he had observed in the family of his friend, Mr. Jenkins. The physicians met, but declared they had seen no other fevers than what they had been accustomed to observe every year, and even doubted, on that occasion, the correctness of Dr. Bard's observations, relative to the nature and character of the disease to which he called their attention: but that accurate observer had been too familiarly conversant with the yellow fever as it appeared in New-York in 1743 and 1762, and too well knew the pathognomonic symptoms of that disease to confound it with the fevers of our own climate: he, accordingly, in the most emphatic language, replied to their doubts, "Gentlemen, within a fortnight you will all see and acknowledge the West-India yellow fever to exist in our city." The event is well known.† The same interval between the first cases of the disease and its subsequent diffusion in the neighbourhood where it first made its appearance is noticed by almost every writer who has recorded the yellow fever in the United States.

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* See Note K. † See Bayley and Hardie on the Epidemic of 1795.—See also Currie on the Fever of 1799.

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A similar interval has been frequently noticed in the history of the plague. Dr. Russell, in his account of the plague of Marseilles, in 1720, observes, "that from the 12th of July to the 23d there was a deceitful pause, during which the popular apprehensions began to subside. The physicians were reproached with ignorance in having mistaken ordinary fevers for the plague. The disease, however, in this interval, had continued to spread in the street, Rue de l'escale, where it made its first appearance."*

It has also been remarked of the plague, as well as of the yellow fever, that the infection spread most rapidly when the atmosphere was not only heated and loaded with moisture, but when it was least agitated by wind or thunder storms. During those calms, when the air may be said to be relatively at rest, it has been uniformly remarked, that the contagion of the yellow fever has multiplied itself most extensively, as was always very apparent by the greater number that were seized within five or six days after such close weather had been observed, all which circumstances certainly conspire to promote the fermentative process that has been contended for.

This is not all: whenever the yellow fever has been introduced into the cities of the United States, its first extension has always been slow and gradual. Upon several occasions its boundaries have been accurately defined by our board of health. This, as I have stated on a former occasion, was remarkably the case in this city in 1805. The disease, in that year, was confined, for some weeks, to a small portion of the eastern side of the city, and, as stated by the board of health, "not a case occurred, in any part of the town, that was not referable to that as its source."† This fact being ascertained, the board accordingly forbade intercourse with the infected portion of our city, and ordered an abandonment of that part of the town, threatening violent measures if their orders were not immediately complied with. In a short time after, the infection extended a few streets further; the board of health again defined its limits, and again declared that still not a case had occurred that could not be traced to this part of the city as its source.*

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* History of the Plague.

† Hardie's Account of the Malignant Fever of 1805.

Will not the same assimilating or fermentative process furnish the most satisfactory solution of the fact noticed by Boerhaave, Cullen, Lind, Russell, and many others, that *fomites* are more to be dreaded than the excretions alone proceeding from the diseased body? Not, however, in the manner those authors suppose, that such fomites acquire greater virulence; but, that by the same process the specific poison has been more extensively multiplied by means of the atmosphere and foul excretions which are involved in the clothing worn by the sick; and that by the same means the danger of the infection has been increased in the same degree that the poison has been multiplied. As a further evidence, too, that the contagion is *multiplied*, but not more concentrated, as those writers have imagined, it is a fact established by every writer on those contagious diseases, that the first cases of every epidemic are uniformly the most fatal; but that, as the season advances, the danger of taking the disease is increased, while the disease itself has, perhaps, become even milder than it was in the commencement.

Let me further ask, do not the processes lately introduced for disinfecting the air by means of the fumes of the acetic acid, the oxygenated muriatic acid gas, the nitric, and sulphuric acid vapours, operate by making new combinations with some of the ingredients constituting the tainted atmosphere, and thereby decomposing the morbid compound? According to Dr. Crawford, "the fluids which destroy the fœtid odours most speedily are those which are acknowledged to contain the greater portion of oxygen, and it is, therefore, extremely probable that this change depends on the union of the oxygen with animal hepatic gas, or some one of its constituent parts." But the explanation which has been offered by the late Dr. Garnett, of the manner in which the oxygen thus employed combines with the hydrogen gas which holds the morbid secretions in solution, appears to me the most satisfactory explanation that has been given of those phenomena.*

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* Chisholm's Letter to Haygarth.—See Note L.

From these facts, I have been led to conclude,

1st. That an impure atmosphere is indispensably necessary to multiply and extend the specific poison constituting *plague, dysentery, typhus,* and *yellow fever.*

2dly. That the impurities of the atmosphere do not produce their effects, in the manner suggested by Dr. Chisholm, by increasing the susceptibility of the system to be acted upon by the peculiar virus of those diseases.

3dly. That, instead of predisposing the body to be thus acted upon, the reverse is the fact; that the predisposition of those who are most exposed to such impure air is less, while those who reside in the pure air of the country are most, liable to be infected when exposed to the contagion.

4thly. That the impurities of the atmosphere are fermentable materials, to be called into action by the specific ferment of those diseases, aided by heat, moisture, and a calm state of the atmosphere, and that

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* Proceedings of the Board of Health of Manchester, p. 40—42.—Robertson's Treatise on Medical Police, vol. 2. p. 127.—Robertson's Natural History of the Atmosphere, vol. 2. p. 352. —See Note M.

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as far as such atmosphere extends, and the circumstances favourable to such fermentative or assimilating process continue, so far those diseases become epidemic, but no further.

The same idea of an assimilating process appears to be expressed by Lucretius, when, speaking of the contagiousness of the plague, he observes,

> " Proinde, ubi se cœlum, quod nobis forte venenum,
> Conmovet, atque aër inimicus serpere cœpit;
> Ut nebula ac nubes paullatim repit, et omne,
> Quâ graditur, conturbat, et immutare coactat.
> Fit quoque, ut in nostrum quom venit denique cœlum
> Conrumpat, reddatque sui simile, atque alienum."
> LUCRETIUS, de Nat. Rerum, lib. VI.

Or, as it has been rendered by that learned surgeon and accomplished scholar, John Mason Good, Esq.

> " But when the heaven, of poisonous power to us,
> First moves remote, its hostile effluence creeps
> Slow, like a mist or vapour; all around
> Transforming as it passes, till, at length,
> Reach'd our own region, it the total scene
> Taints, and assimilates, and loads with death."

If the view which has been taken of this subject be correct, a still more important truth is the result; that, while by a rigid and well-executed system of quarantine laws we have it in our power to guard against the introduction of the spark that kindles the flame, we are also enabled, by means of domestic cleanliness and ventilation, to extinguish it when introduced. For this purpose our magistrates and guardians of the public health cannot be too attentive in their police regulations to have all noxious materials removed from our streets and our dwellings; and, at the same time that they are ornamenting our cities by the erection of magnificent buildings, and the introduction of other important improvements, they should also avail themselves of every opportunity which may present of widening our streets, and of reserving squares and other pieces of ground to be ever kept vacant, as among the most effectual means of preserving the health of our citizens, and guarding against the propagation of contagious diseases.

——τὸ Πελασγικὸν, ἀργὸν ἄμεινον.

——"**Best is Pelasgic empty**"

was wisely expressed by the Pythian oracle; thereby denoting that every large and populous city, as well as Athens, should have its *pelasgics*, or vacant pieces of ground, as so many reservoirs of pure air, for the purpose of counteracting the effects of contagion when introduced.

DAVID HOSACK.

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ADDITIONAL NOTES

ON

CONTAGION, &c.

NOTE A. (*See page* 202.)

Observations on Contagion. Communicated in a Letter to Dr. Chisholm, of (Clifton) England; dated New-York, July 16, 1808.

DEAR SIR,

AGREEABLY to my promise in a former communication, I shall now state to you the result of my observations on contagion, a subject which has created so much dispute in the medical world, and which divides our profession in the western as well as in the eastern hemisphere. As far as I have examined this subject, it appears to me to be more a dispute about *words* than *facts*. The abuse of the terms *contagion* and *infection*, and the neglect of writers in not annexing to them a precise definition of the manner in which they severally employ them, have, I believe, been the source of our medical warfare, relative to the contagiousness of yellow fever, and some other diseases: *e. g.* the greater number of medical writers enumerate, in the list of contagious diseases, all those which are in any way communicable from one person to another, whether by *contact*, *fomites*, *atmosphere*, &c. without designating the *circumstances* attending these several modes of communication.

Lind, in his papers on contagion and infection, (which he considers as synonymous terms,) is guilty of this error, in which he has been followed by most writers upon the subject of fever, &c. The late Dr. Bayley, in his account of the yellow fever which prevailed in New-York in 1795, proposed a distinction between *contagious* and *infectious* diseases. He made use of the first term to denote such as are communicated under any circumstances of atmosphere, whether pure or impure, as small pox, measles, &c. *Infectious* diseases he denominated those which are communicated in consequence of an impure or vitiated state of the atmosphere, *i. e.* that the *impurities* of the atmosphere communicate the disease, not that the air contains any *specific material* derived from the patient, except such as may be occasioned by want of cleanliness. This distinction, proposed by Dr. Bayley, is, in my opinion, an approach nearer the truth than any of his predecessors have advanced, but it does not present us with a view of the *whole truth*, upon the subject. The visiter or attendant contracts disease from one of *two sources*, either from the filth of the sick room, or from a *specific something* issuing from the body of the sick, the consequence of the peculiar disease under which he labours. If a person visiting another ill of the *yellow fever* or *plague*, derives his disease from the *impure atmosphere* of the apartment, I ask how it happens, that in all instances he contracts the *same disease* with that of the person whom he visits? Why is his disorder not an *intermittent*, a *remittent*, *jail fever*, or *dysentery*, which are considered the usual produce of filth? If he derives any thing specific from the sick, his disease is then assuredly not to be considered as occasioned by the *atmosphere*, but depending on the *peculiar condition of the fluids*, or state of the system, induced by the action of a specific poison; in other words, it is to be considered a *contagious* disease. The distinction proposed by Dr. Bayley, inasmuch as it does not account for the communication of the *peculiar form* of fever or disease which is thus propagated, I, therefore, consider to be insufficient to account for the circumstances attending the communication of those diseases to which it is applied. That I may not be misunderstood, I will suppose A to be ill of *dysentery*, a disease well known to be attended with a *peculiar train of symptoms;* he is in a small, confined apartment, his person is neglected, the atmosphere around him is rendered impure and offensive; under these circumstances B visits him, and a few days after is also taken sick with the *same disease*, attended in all respects with the *same* dangerous symptoms which characterize the disorder of A. Dr. Bayley, and those who adopt the doctrine of *infection* as opposed to *contagion*, consider the disease of B to proceed from the *impurities of the chamber*, and not from any thing *peculiar* emanating or secreted from the body of A. But as we may, without hazard, visit an equally filthy chamber where C lies ill of *cholera morbus*, or D with a *broken limb*, I therefore ascribe the disease of B to something more than the *impure air* of the chamber of A. I ascribe it to a *peculiar virus* generated in his system by the disease under which he labours, and communicated by his excretions to the surrounding atmosphere, rendering it thus capable of producing the same disease in those who may be exposed to its influence.

The communication of this virus from the sick to the well, in whatever form it may be conveyed, as uniformly produces the *same disease*, as *inoculation* excites the *small pox*, or *vaccination* conveys the *vaccine virus*. So far, then, there is something in *common* in the communication of contagious or infectious diseases, which should be accordingly expressed in the language we employ—some of those diseases are conveyed in one form, others in a different; we should then be equally careful to mark those circumstances in which they *differ*, as well as those which they possess in *common*.

Such an arrangement appears to me not only practicable, but, at the same time, calculated, in some degree, to harmonize the differences of opinion which now separate the contagionists and non-contagionists. Under these impressions, I propose to arrange those diseases which are communicable from one to another under three heads. First, those which are communicated *exclusively* by *contact*. In this class I enumerate

The Itch,
Syphilis,
The Sibbens of Scotland,
The Laanda of Africa,
Frambœsia, or Yaws,
Elephantiasis, or Leprosy,
Hydrophobia, and
The Vaccine virus.

Neither of those diseases can be communicated in any other way than by *contact*; they are, therefore, *contagious* diseases, in the strict etymological sense of the term. It is also to be remarked, that these diseases are never conveyed through the medium of the *atmosphere*; actual contact alone can communicate them from one person to another.

These diseases, acknowledged by all to be contagious, and so denominated by all writers, have a law of communication peculiar to themselves. But there is a second class of diseases also considered as contagious, which are communicated under different circumstances, governed, in this respect, by different laws of communication.

Those to which I now allude are such as are communicated both by *contact* and by the *atmosphere*. In this class I arrange

Small pox,
Measles,
Chicken pox,
Hooping cough,

Scarlet fever, and
Cynanche maligna.

Contact, or the *close approach* to the sick, labouring under these diseases, will communicate them to those who are susceptible of their influence—but they are no less communicable through the *medium of the atmosphere.* A *second law,* which governs the communication of this class of contagious diseases, is, that they are communicable in *every season,* in the heat of *summer,* as well as in the cold of *winter*—in a *pure* as well as in an *impure* air, though more readily by the latter than the former. A *third law* of communication in this class of diseases is, that the persons afflicted with them are not generally susceptible of a second attack. I say *generally,* because exceptions are related upon very respectable authority.

This second class of contagious diseases is, therefore, abundantly distinguished from the first; but they are still associated by most medical writers under the same head of contagious diseases, without assigning to each class its discriminating characters.

The same want of discrimination has, in my opinion, occasioned the numerous disputes among physicians relative to the contagiousness and non-contagiousness of those fevers which I enumerate as the *third* class of diseases that are communicable from one person to another. Under this head I arrange

Plague,
Yellow fever,
Typhus, *jail, ship, hospital,* or *lake fever,* and
Dysentery.

These diseases are only, in general, communicable through the medium of an *impure* atmosphere: in a pure air, in large and well ventilated apartments, when the dress of the patient is frequently changed, all excrementitious discharges immediately removed, and attention paid to cleanliness in general, these diseases are not communicated, or very rarely so, from one to another. But in an *impure* air, rendered so by the decomposition of animal and vegetable substances, as takes place in low marshy countries, or by concentrated human effluvia, as in camps, jails, hospitals, or on shipboard, they are rendered not only extremely malignant and mortal in themselves, but become communicable to others who approach the sick, or breathe the same atmosphere, which has become *assimilated* to the poison introduced, insomuch that *the same specific disease* is communicated, whether it be the *plague, yellow fever, typhus,* or *dysentery.*

Hence we account for the fact stated by Sydenham, and other writers on epidemics, that the prevailing disease swallows up all other disorders; *i. e.* that during the prevalence of an epidemic plague, typhus, dysentery, or other diseases of this class, every indisposi-

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tion of a febrile sort readily assumes the character of the prevailing disorder. We know this to be experienced in the diseases of other countries, and we see it daily exemplified in our own: both in our cities and in the country towns, when, after heavy showers of rain, and the action of a hot sun, a decomposition of vegetable and animal substances takes place, and dysentery or typhus fever is produced, it assimilates the air to itself, whatever may be the acting poison. But under other circumstances of weather and season, the disease thus originating from some local circumstances, or from a peculiar habit of body in the person so affected, does not extend beyond the family in which it first occurred, or, perhaps, the individual in whom it originated.

This class of diseases, therefore, like the former, has a law peculiar to itself; *i. e.* the diseases composing it are communicable, or otherwise, depending upon the *condition of atmosphere* in which they occur or are introduced—whereas those of the second class are conveyed from person to person, through a *pure* as well as an *impure* medium: but they also are rendered more virulent and malignant in an atmosphere charged with miasmata than in that which is free from such ingredients.

It is also, I believe, generally true of the diseases of the *third class*, not perhaps excepting the *plague* and *yellow fever*, that they may be taken a *second time*. This has been advanced by the advocates for the domestic origin of yellow fever, as an argument against the contagiousness of this disease.

But, upon the same principle, they must deny the contagiousness of all those disorders which I have enumerated in the *first* class, as *itch, syphilis*, &c.; for most of them are also to be taken a second time: yet they are acknowledged by all to be *contagious diseases*. In the same manner, many persons make the *small pox* a standard, and conclude that yellow fever is not contagious, because it is not communicated under the same circumstances of atmosphere and season, and governed by the same laws with that disease.

They might with the same propriety conclude, that the *scarlet fever* is not contagious, because it is not attended with the pustules of small pox. This teaches us the importance of correct language to convey the several degrees of contagion which have been noticed; and that, while we may make use of the terms now in use, we should annex to them such explanations as will convey those different laws of communication which have been enumerated. With those precautions in the use of the language we employ, I believe, the contagionists and non-contagionists will find themselves very much in the situation of those theologians of whom Pascal speaks, and ready to adopt the expression of one of them, when he observes,

> "La difference qui est entre nous est si subtile, qu'à peine pouvons nous la marquer nous mêmes."

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We would then be ready to admit, that the yellow fever is a contagious or communicable disease, in an *impure* atmosphere; but not generally so where the air is preserved pure and free from noxious materials.

This doctrine, too, I believe, will better account for the apparently contradictory facts, which have been urged by the advocates of the two opposing opinions, than any system that has been adopted.

It will also lead to a system of police regulations, which will best insure us against the ravages of yellow fever when introduced, at the same time it will teach us carefully to guard against the introduction of it from abroad.

I shall treat this subject more at length upon another occasion, in connexion with the evidences of the importation of the yellow fever into the United States.

I am, sir, with sentiments of high respect, your's,

Dr. Chisholm. **DAVID HOSACK.**

NOTE B. (*See page* 202.)

Strictures on the classification of Contagious Diseases proposed in the preceding communication, contained in a letter from Colin Chisholm, M. D., F. R. S., &c. &c.

Clifton, (*England*,) *October* 14, 1809.

Dear Sir,

You will find in the October number of the Edinburgh Medical and Surgical Journal the observations on contagion you favoured me with some time ago.

I approve highly of the first part of your paper; but on reading the third class of your division of contagious diseases, I find myself obliged to dissent, or, at least, to hesitate in affixing entire approbation to it: and, indeed, I have reason to think, that when you have reconsidered the admissions and concessions you have there made, and the tendency which they have to throw all fevers, however arising, except those which are symptomatic of what are called specific contagions, and which comprise the whole of your second class, into an undefined state of anomaly, you may see cause for retracting them, or giving them more limitation. For my own part, I feel more inclined to divide all diseases of contagion into two classes, which may be denominated apyrexious and pyrexious; and as the latter are distinguished, mediately or immediately, by specific causes, they may be divided into two sections, the symptomatic and the ideopathic.

If a febrile disease has for its cause, an aura, a gaseous fluid, emanating from the body of a man labouring under that fever, which will manifest activity only within a certain, generally definable, distance from that body, how can we with any propriety of conception or language, say, that such a disease is only communicable through the medium of an impure atmosphere? Again, is not a fever proceeding from the action of marsh miasmata different from the fever we have just been considering, inasmuch as the one *is not* communicable—the other *is certainly* communicable from the subject of it to be a healthy subject? How then can we admit such a proposition as the following: "In an impure air, rendered so by the decomposition of animal and vegetable substances, as takes place in *marshy countries*, or by concentrated human effluvia, as in camps, jails, hospitals, or on shipboard, they (your third class) are rendered, *not only extremely malignant and mortal in themselves, but become communicable to others who approach the sick, or breathe the same atmosphere which has become assimilated to the poison introduced, insomuch, that the same specific disease is communicated, whether it be plague, yellow fever, typhus, or dysentery?* Pardon me when I say I do not understand this; when I say I perceive a marked inconsistency in it; several causes of an opposite nature producing effects all partaking of one general principle, contagion. Is not this a very near approach to the heterogeneity I have apprehended? I suspect that dysentery does not come with marked propriety into the same class with plague, yellow fever, (malignant pestilential,) and typhus, for it is certainly oftener the product of marshes than morbid animal effluvia, and partakes very often of the type of intermittents. When I thus object to your classification as it relates to pyrexious contagions, I fully admit the occurrence of hybrid fevers, that is, contagious fevers with the types of those we know to proceed from the action of marsh miasmata. But on these occasions, all the conditions which constitute pyrexious contagions are present; their form is only a little changed; their nature is unaltered: they are communicable only within the radius of contagion. That plague, or yellow fever (by which I understand the fever to which I have given the name malignant pestilential,) more especially, "are *only* communicable through the medium of an impure atmosphere;" that in a pure air, in large and well ventilated apartments, &c. they are not communicated, or very rarely, are propositions which I much doubt, because they are most certainly in direct contradiction to my own experience. I speak more immediately concerning the malignant pestilential fever. Were this a fact sanctioned by universal experience, (forgive the pointed expression, it is only for your own eye,) the extirpation of this fever might, in general, be a very easy operation. But I have seen too many proofs of its contagion communicating itself to healthy persons in a pure atmosphere, to admit the validity of your definition of it. If healthy persons, or persons possessing every internal feeling and external appearance of health, passing to leeward, within six feet of other persons just recovered from the malignant pestilential fever, and wearing the clothes they had on their persons during the presence of the fever, have received the contagion of the fever from them, and have perished under its action; if this has happened in the open air (wherein nothing generally conceived to be impure, could be perceived) surely your definition cannot be said to accord with experience. Again, if in a chamber kept as clean and as pure as it is possible to keep a sick chamber, the disease has been in many hundred, I might safely say thousand, instances, communicated from the persons afflicted with it, to others in a state of apparent health, when the latter have approached the former to within the radius of contagion; if this is true, and the proofs of its being so are innumerable, I must again say, that surely your definition cannot be said to accord with experience. Had it been advanced, indeed, that all pyrexious contagions, but particularly that of the malignant pestilential (yellow) fever, are rendered more violent in their action under the circumstances you have stated, no possible objection could be made to the proposition, because it is supported and proved by all experience; and the reason is, perhaps, as obvious as the fact itself is generally admitted. It does not proceed from the impure atmosphere becoming assimilated to the poison introduced, but from rendering the system of the healthy person, who receives the poison by approximation to the sick, more susceptible, at the moment of its introduction, of its peculiar action; or the chemical physician may say, had it been advanced that the atmosphere of the sick chamber, being confined and close, as it too often is, is rendered obnoxious to health, by having its oxygen diminished by the respiration of the persons, sick and well, inhabiting it, and that thereby the effluvia of contagion become more concentred by being less subjected to decomposition or solution, whichever you will, the proposition would be less objectionable. But in either case, the laws of the existing contagion are not affected; in the one, the healthy person is only made more susceptible of its impression; in the other, it becomes less volatile, and therefore more virulent, and more certain of infecting. But the atmosphere is not assimilated to its principle. And, indeed, it must be evident, that were this not the fact, we should have no right to expect a specific disease produced by a specific contagion—plague and yellow (malignant pestilential) fever produced by the contagions peculiar to them.

But all fevers appearing in the circumstances you mention, would necessarily have an undefined character; they would be universally anomalies; a result so inconsistent with the regularity of nature, I imagine, has never been met with. There are, indeed, seeming anomalies produced by a combination of morbid causes and effects. But as these are well known to depend on the irregular performance of some particular functions, occasioned generally by morbid depositions on the organs of these functions, they lose their anomalous form in the mind of the judicious physician, and are cured by the adoption of appropriate means. Now, as the diseases which you class under your third head, have each a peculiar and well-defined character, so must they severally have a peculiar contagion; and the circumstances under which you represent them, must be considered as purely adventitious, and aiding only inasmuch as they may predispose the healthy body to be acted on by the peculiar contagion it is exposed to, or as they may render the basis of that contagion less decomposable. One word more, and I am done with my impertinent critique: are not all contagious diseases capable of communication by *fomites?* (a word which, by the by, does not seem to be well understood. Servius's comment on a passage in the first Æneid of Virgil, gives a more distinct idea of the word *fomes* than any I have met with. You know it is received by our medical lexicographers as derived from the verb *foveo*, a derivation I doubt much the correctness of. The passage I allude to you will find at verse 178, the last member of which is "rapuitque in fomite flammam;" on which Servius says, "Fomes sunt assulæ quæ ab arboribus cadunt, cûm inciduntur, et igni concipiendo commodæ sunt." Now, were we to substitute words in the following manner, we should have, I imagine, a correct idea of fomites: Fomes sunt indusià, panni aliaque vestimenta quæ corporibus ægrorum peste aliave febre contagiosa laborantium, cadunt; cûm inciduntur et contagionè concipiendæ commodæ sunt.) If they are, what has impure atmosphere, so rendered by the decomposition of animal and vegetable substances, to do with their origin? The purest atmosphere conceivable, that is, an atmosphere in all respects well conditioned to support animal life in a perfect state, cannot prevent an attack of the malignant pestilential (yellow) fever, if a healthy person is exposed to the fomes of its contagion, and is predisposed to be acted upon by it. The remarkable proof of this which occurred at New-Haven, and which has been so ingenuously related by Dr. Munson, must be perfectly in your recollection. The present inquiry has nothing to do with those singular ideosyncrasies which resist contagion, although exposed to that of variola, rubeola, &c. as well as that of malignant pestilential fever, &c.

As the foregoing is not entirely my own opinion relative to your classification of contagious diseases, I hope, and indeed feel convinced, you will forgive the freedom I have taken in so candidly giving it. You will also, I am satisfied, receive in good part, in the spirit of true philosophy, my request, that you will reconsider particularly your third head, which I imagine is the only objectionable one. I am aware of the inconsistency which may be attributed to me in stating a proposition so opposite to that which may be found in my Essay on the Malignant Pestilential Fever, vol. 1. p. 281, and in my letter to Dr. Haygarth, p. 142. But herein, I trust, I manifest that disposition which should be paramount in the minds of those whose object, in all discussions, is truth. Subsequent inquiry and reflection have convinced me that I stood not on solid ground, when I stated, that among the causes of pestilence is the product of animal substances of every description, deprived of life, and in a state of putrefaction: and I cordially agree with the critic on my letter to Haygarth, when he says, "We are more inclined to think that there is a specific contagion distinct from mere putrefaction, and which, perhaps, is not cognizable by any of our senses."—*Crit. Rev. July*, 1809.

It may be asked, as all contagious diseases proceed from certain specific or peculiar causes, what are those causes, and how arises that diversity of character assumed by contagions? To this question we must be silent; for no pathologist, however experienced, and however deep his research into nature may be, can give a satisfactory answer. We know that there is such a diversity, and, in general, we have some knowledge of the treatment they severally require. Perhaps this is as much as we ought to know. It is a subject which must for ever elude human research. Neither anatomy nor chemistry give any aid here. Exuberant fancy may, indeed, wanton in theory, and may conceive every different form of contagion as proceeding from a different combination of the same chemical principles acting differently on the organs of our frame, or on the fluids which they secrete. But strip these notions of their fancy-dress; let them stand naked before us, and they become mere phantasms. Par levibus ventis, volucrique simillima somno.

Believe me to be,

Dear sir, very faithfully your's,

Dr. Hosack. C. CHISHOLM.

NOTE C. (*See page* 205.)

The American publishers of the New-York edition of Neale's translation of the work of Assalini on the plague of Egypt, in their introductory observations, have, among others, the following singular remark:

"The existence of such contagion [of the plague] has never been proved by the evidence of one of the senses. The contagion is a mere conceit of the mind; and all reasoning upon such a visionary and fancied agent can be but hypothesis, and have no better claim to our assent than the fluid of magnetism, and the ether of gravitation; an assumption not near so worthy of our assent, as if it had been said, that the invisible angel of destruction had literally and bodily descended, sword in hand, to execute a heavy judgment of his Lord."

In refutation of these extraordinary and unwarrantable assertions, it were an easy matter to cite a volume of evidence. The following facts, selected from others of a similar kind, will, I trust, be sufficient for the purpose of demonstrating the fallacy of the doctrine of the American publishers referred to, and the correctness of the view that has been contended for, relative to the contagious character of the plague.

Dr. Guthrie, a celebrated physician of St. Petersburgh, in his inquiries relative to the contagiousness of the plague, observes:

"Chance threw in my way an excellent opportunity of examining into the merits of this opinion, by consulting the physicians and surgeons of the Russian army, lying in the conquered Turkish provinces of Moldavia and Walachia, where the plague ever obtained more or less during the whole war, and at the beginning raged with destructive violence; and on addressing myself to Baron Ash, physician general, I had an answer that met my ideas on the subject.

"The difficulty of ascertaining the exact time when the infection is received, and, consequently, the interval that takes place before the attack of the pestilential fever, must appear upon the face of the case, except experiments were to be made on purpose, which is scarcely to be expected. However, the intrepidity of a single man has thrown some light upon the matter: this was Mathias Deggio, one of the surgeons of the hospital at Buckarest, a building appropriated to the cure of the plague in the Russian army.

"He, perceiving the gentlemen of his profession condemned, in a manner, to death, if punctual in their duty, had the resolution to inoculate himself for the plague, in the full confidence of its efficacy, and ever afterwards found himself invulnerable, whilst his companions around him were falling victims to its fury. He produced the disease by inserting, with the point of a lancet, under the epidermis of his arm, matter from a pestiferous abscess, and followed the cold regimen observed in the small pox, as he had imitated its mode of inoculation; on the fourth day of the puncture the fever declared itself."

Dr. Guthrie adds "the Baron then said a great deal in favour of inoculation of the plague, and supported his opinion with the case of Mathias Deggio given above; and the analogy that has been observed between the plague, small pox," &c. (*Medical Commentaries Edin. vol.* 8.)

Another fact of a similar nature is recorded by Sir Robert Wilson: "That daring spirit of investigation into the causes and effects of those diseases, whose principles are yet unknown, and which has so much distinguished the profession, was not to be intimidated by the menacing consequences of a bold examination into the powers and properties of the plague.

"Dr. Whyte, an English physician, determined to discover if this malady, so destructive to a large portion of the globe, and which filled with apprehension the remainder, could not be checked, or rendered less virulent, by the introduction of inoculation.

"Resolved to become the patient of his own speculation, during the time the plague raged again at Rosetta, (which it did towards the fall of the year, when numbers of Sepoys died,) he inoculated himself with matter taken from the buboes of an infected person. The attempt failed twice; the third proved fatal; in three days after the symptoms appeared, he died, falling a much-to-be-lamented victim to a disinterested zeal, benevolently and intrepidly directed for the benefit and happiness of the community." *Wilson's Hist. of the British Expedition to Egypt, 4to, page 257.*

The highly respectable Dr. M'Gregor, (*see Medical Sketches of the Expedition to Egypt from India*) relates the same fact more circumstantially as follows: "I know not that I can better describe the disease than by a short statement of the cases of some of the medical gentlemen who had the disease, most of whom wrote me accurately every thing that they felt. Dr. Whyte entered the pest-house at El Hammed, on the evening of the 2d of January, 1802. In a letter of that date he writes to me, '*I just now inoculated myself, by friction, with bubonic matter on the left thigh*;' on the 3d, he says, '*I have this morning inoculated myself, by incision, on the right fore arm.*' Mr. Rice, then doing duty in the pest-house at El Hammed, gives the whole of the case. In a letter on the 3d of January, he writes to me, '*Dr. Whyte came here last night; soon after he came in, he rubbed some matter from the bubo of a woman, on the inside of his thighs. The next morning, he inoculated himself in the wrist with a lancet, with matter taken from the running bubo of a Sepoy*:' In subsequent letters Mr. Rice says '*that Dr. Whyte continued in good health on the 5th, and all day on the 6th, till the evening, when he was attacked with rigors and other febrile symptoms. After sweating profusely, he was better in the morning of the 7th, but in the afternoon the shivering returned; and after it had continued 30 minutes, a severe hot stage came on, then a profuse sweating followed, but with it much affection of the head, tremor of the limbs, particularly of the upper extremities, tongue black and dry, skin hot, pulse full, hard, and irregular, thirst, great prostration of strength, and anxiety. The head was the only place he complained of, and it seemed to be the principal seat of his disease: On the 8th, these symptoms continued, and there was some delirium; he begged to be removed from the pest-house at El Hammed, to the old pest-house at Rosetta, under the charge of the Arabs. He was removed on the morning of the 9th, and died in the afternoon of that day very delirious.*'"

Another instance of the same intrepid, but benevolent effort to diminish the sufferings of humanity, is recorded by Sonnini, (*Travels into Greece and Turkey, London ed. p.* 497.) "Every physician," says that writer, "has not the courage, or, to speak more correctly, the madness of that Russian surgeon, prisoner at Constantinople with a number of his countrymen, who took it into his head to inoculate these unfortunate beings with the plague, in order to render the contagion less destructive: by this means he killed two hundred of these prisoners; and, fortunately for the rest, the inoculator, after having performed the operation on himself, died of his own treatment."

M. Assalini has stated, in corroboration of his own opinion of the non-contagiousness of the plague, that M. Desgenettes, the chief physician to the army of the East, while in Syria, inoculated himself with the matter of the plague, without taking the disease, and that he made this inoculation under the persuasion that the plague was not contagious. The following observations, taken from the work of M. Desgenettes himself, will clearly show the incorrect statement of M. Assalini on this subject, and that Dr. Desgenettes considered the contagiousness of the plague as absolutely demonstrated.

" Ce fut pour rassurer les imaginations et le courage ébranlé de l'armée, qu'au milieu de l'hôpital je trempai une lancette dans le pus d'un bubon, appartenant à un convalescent de la maladie au premier degré, et que je me fis une légere piquure dans l'aîne et au voisinage de l'aisselle, sans prendre d'autres précautions que celles de me laver avec de l'eau et du savon qui me furent offerts. J'eus pendant plus de trois semaines deux petits points d'inflammation correspondants aux deux piqures, et ils étoient encore très sensibles lorsqu'au retour d'Acre je me baignai en présence d'une partie de l'armée dans la baie de Césarée. Cette expérience incomplete, et sur laquelle je me suis vu obligé de donner quelques détails à cause du bruit qu'elle a fait, prouve peu de chose pour l'art ; elle n'infirme point la transmission de la contagion, démontrée par mille exemples ; elle fait seulement voir que les conditions nécessaires pour qu'elle ait lieu ne sont pas bien déterminées : And, as a further evidence that this experiment, if it deserves the name of an experiment, was made for the purpose, as Dr. Desgenettes declares, of inspiring the troops with confidence, he adds, "Je crois avoir couru plus de danger avec un but d'utilité moins grand, lorsqu'invité par le quartier-maître de la soixante-quinzieme demi-brigade, une heure avant sa mort, à boire dans son verre une portion de son breuvage, je n'hésitai pas à lui donner cet encouragement." (*Histoire Médicale de l'Armée d'Orient, par le Medecin en Chef, R. Desgenettes, a Paris, an* x. 1802.)

In addition to the testimony of Dr. Desgenettes, I subjoin the following interesting letter from Alire R. Delile, M. D., who accompanied the French army in their expedition to

Egypt, and who, as a member of the Institute, had the most ample opportunity of obtaining correct information relative to the opinions of the medical staff on this subject.

DEAR SIR,

I AM happy of any opportunity which reminds you of me, and on the subject upon which you desired an answer, I am ready to give it to you.

Comparisons have been made between contagious diseases, viz. the plague of the east, and the yellow fever of America. Opinions have been deduced from the examination of facts in different cases; but facts have not always been sufficiently ascertained for us to rest our opinions indiscriminately upon them.

I was in Egypt a witness to many facts which I recollect perfectly. A report that the inoculation of the plague had been attempted in vain must have originated from letters sent from Syria to France, and notes spread afterwards through Europe and America.

I was every day in the company of medical men, in Cairo, and of people of learning, who devoted a great part of their time to study and observation, and I have heard the report of the inoculation of the plague always contradicted; nor did I ever hear M. Desgenettes relate, as attributed to him in publications, that he had tried to inoculate himself with the venom of the plague. He could not wish for any additional honour which the boldness of an attempt of that sort had, in the opinion of many, reflected upon him: any degree of honour which could gratify him, he had acquired by his frequent attendance upon the sick, by his conferring all kind of comforts upon them, and by his daring to feel their pulse, their tumours at their bed, though fatal experience had taught him that most practitioners had fallen victims to their resolution in performing such an office. But among professional men, the importance of the inoculation of the plague had induced M. Desgenettes to authenticate a fact which I consider a mere rumour has circulated.

From several of my friends and colleagues of the commission of arts, namely, M Coquebert and M. Champy, who died of the plague, M. Pothier, who recovered, having been attended by M. Desgenettes, I have had strong reasons to convince myself of the contagiousness of the plague. The quarantine laws established of old, with a great deal of severity in France, after many distressful events, the preventive means used by the Europeans settled in the cities of the east, who, by shutting themselves and their families in houses, and by avoiding contact with people, and with every thing from out of doors, except when well washed, and who are never attacked with the disease; while the loss of those who have remained exposed to the contagion is often lamented, have been sufficient examples to convince me early of the truth of that opinion. Further I cannot say any thing from my own experience. The French physicians differed in their opinions whether the plague was indigenous or accidentally imported in Egypt, *but none of them denied its contagiousness.* Owing, perhaps, to the same opinion that I had, and to the natural propensity to imitate what others did with success, in avoiding, as much as they could, communication and contact, I escaped the danger, and I am happily placed in the situation to express to you the sentiments of esteem with which I remain,

Sir, your most obedient,
humble servant,

Dr. Hosack. ALIRE R. DELILE.

Without further enlarging on this head, we are, I believe, prepared to conclude, with the learned Dr. Parr, "That those who have suggested and disseminated doubts of the contagiousness of plague, are answerable for the lives of thousands, and, in some instances, have paid the forfeit with their own." *London Medical Dictionary.*

NOTE D. (*See page 225.*)

I have remarked in the text as an evidence, among others, that the yellow fever which prevailed in New-York in the year 1798, was not produced by putrid beef, that those persons who were employed in removing such putrid provisions from the city escaped the yellow fever. The same respectable gentleman, Mr. Edmund Prior, who furnished me with that fact, has also informed me, that of *forty* persons who were engaged in that particular service, under his immediate inspection, *thirty-eight* were attacked with a complaint of a very different character, the *dysentery;* which disease it is well known to all practical writers, frequently arises from decomposed animal and vegetable matter, as its exciting cause.

The remaining *two* persons who had been thus employed by Mr. Prior, escaped the dysentery, with which their comrades were afflicted; but upon leaving that service, and being afterwards exposed to the contagion of *yellow fever,* while working on board of ships, they fell victims to that disease; a circumstance which clearly shows that dysentery and yellow fever derive their origin from different sources: for additional particulars on this head, see Sketch of the Rise and Progress of the Yellow Fever, &c. by William Currie, Philadelphia, 1800.

That the yellow fever of 1798, did not proceed from the putrid beef, to which many physicians ascribed its origin in that year, is also evident from the facts stated in the following extract from a letter which I received from the Rev. Dr. M'Knight of New-York, dated November 6th, 1809.

"In the year 1798, Melancthon Smith, and another man whose name I do not recollect, were the two first instances of the yellow fever in New-York. They had both been on board the ship Fame, as she came up to the New-Slip in the East River, where she unloaded her ballast, and emptied her bilge water. The stench occasioned thereby was so intolerable, that, the wind being south, the inhabitants on the north side of the dock had to shut up their doors and windows, and some of them left their houses. To my knowledge, as many as twelve or fifteen died in that neighbourhood, in the course of two weeks, several of whose funerals I attended. This same vessel was afterwards removed to a dock in the vicinity of the Coffee House: there several persons, who wrought on board of her, who resided in Eden's Alley, took the fever, and carried it up into that part of the town. Just at this time, there was a very heavy rain, which filled most of the cellars, in the lower part of the city. The fever raged with alarming violence on Golden Hill. It assumed the appearance of the plague."

Thus, then, it appears that many cases of the fever of that year, existed in the city, before the heavy fall of rain took place, and its effects upon the stored provisions were perceived; consequently, the yellow fever of that season did not proceed from those putrid materials as its source. That the foul state of the air which ensued lent wings to the contagion, I trust will by all be admitted.

NOTE E. *(See page 225.)*

To employ the language of that distinguished medical philosopher, Dr. Chisholm, it has become a kind of axiom in medical physics, that the effluvia of decomposed animal bodies are the most certain and frequent cause of malignant and pestilential fevers.

This opinion, which has been promulgated from age to age, and which has been so generally received, because it has not been investigated, has, at length, been most ably examined and refuted by Dr. Chisholm.

From his learned and elaborate essay on this subject, I have taken the following statement of facts, as illustrative of the doctrine which has been advanced in the text.

"There are grounds of belief, that even the concentration of the miasms of putrid animal substances, does not give rise to fever, and seldom, if ever, to disease of any description. The following facts certainly militate against a contrary conclusion.

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"1. In the neighbourhood of Bitton, in Gloucestershire, about a mile from Willsbridge, which was my residence for nearly four years, there is what is called, 'a bone manufactory,' in which animal bones, after the extraction of their medullary oil by boiling, are distilled, and yield the usual products, muriate of ammonia and sulphate of soda. From this manufactory, a fœtor of the most offensive nauseating nature proceeds, and fills the atmosphere for nearly a mile around, diminishing in strength as it recedes from its source, and in proportion to its dilution or decomposition. The country is thickly inhabited, and near the manufacture itself is the village of Oldland, the population of which is very considerable; yet, in not one instance has this manufacture proved, in the smallest degree, injurious to health. I have frequently visited it with the most complete impunity. For several years the superintendant, Mr. Henderson, his wife, and family, lived in a house, having on one side, connected with it, that in which the retorts are placed, and on the other, that in which the bones are boiled:—yet they had every appearance of health, and they assured me they enjoyed it. A more convenient house, on a neighbouring hill, becoming vacant, Mr. Henderson rented it for the accommodation of his family. Soon after they began to reside in it, they lost their health, and were, when I last saw them, much inclined to return to their old and stinking habitation. This exemption from disease in the manufactory of sal ammoniac, &c. has been noticed by Morveau and Chaptal. *Edin. Med. and Surg. Journ. vol.* 2. *p.* 295.

"2. Between Bristol and Hanham, on the banks of the Avon, is Conham, remarkable for nothing but its having been chosen for the site of an extensive manufactory for the conversion of the flesh of dead animals into a substance resembling spermaceti—a project which has been relinquished several years ago. This being also not very distant from Willsbridge, I made a good deal of inquiry into the result, as far as it affected the health of those immediately engaged in the process, and of the inhabitants of its thickly-peopled neighbourhood. The foreman, or superintendant, Richard Bolston, residing now at Jeffries-hill near Hanham, has been my principal informant: and his account was confirmed by that of Mr. Thomas Pearsall, of Willsbridge, and other respectable persons. Bolston was two years employed constantly in this business; and during that time resided in the midst of dead animal bodies, horses, asses, and dogs, many of which were left to pass through the natural process of putrefaction. He had three labourers under him, and he declares that neither himself nor any of these men suffered from a moment's sickness, or, indeed, experienced the smallest inconvenience. Their business was to cut up the carcasses, to strip the muscular flesh from the bones, and to dispose of it first in boxes, perforated for the admission of water, which were afterwards laid in pits filled with water. The entrails, and every part not useful to them, were left to putrefy on the surface. The pits prepared for the animal matter thus disposed were seven feet deep, and four broad and long, and each calculated to contain the flesh of fifty horses, beside asses and dogs. An idea may, therefore, be formed of the immense volume of putrid animal effluvia, enveloping continually the persons of Bolston and the labourers, by being informed that there were six of these pits, and, consequently, three hundred carcasses of horses, and as many of asses and dogs, exhaling, in greater or less abundance, their offensive miasms. Nothwithstanding this Bolston declares, that although the stench was offensive in the highest degree, yet he and those with him sustained no injury—and to this the inhabitants of the country around bear ample and angry testimony, both in relation to Bolston and themselves.

"3. Another remarkable fact, well known where the manufactory of refined sugar is extensively carried on—butchers preserve the blood of the slaughtered animals in open tubs, kept in close, small, shut-up houses, sometimes for several weeks, until the quantity required is completed, or until there is a demand from the sugar-bakers for it. It is then, in a putrid state, conveyed through the public streets, in carts or drays, to the sugar-houses, emitting the most offensive effluvia, and extremely annoying to all those who pass it. It is seldom immediately used by the sugar-bakers, but kept by them in casks, in a putrid state, filling the air of the manufactory, and frequently of the vicinity, with its putrid miasms, or what Galen and his followers would call ἄττα λοιμου γεννησομενα, the seeds of pestilence. But what is the result to the workmen, or to the inhabitants of the surrounding houses?—nothing inimical to health. This fact exists constantly in the city of Bristol, where, in general, the streets are extremely narrow, and the houses excessively crowded, and ill ventilated—and yet the harmless nature of these exhalations may be daily verified—I speak from my own observation, and the experience of the most respectable sugar-bakers. In summer it is more remarkable than in winter.

"4. Mr. Newman, surgeon in Stokes Croft, Bristol, a gentleman of great worth and professional skill, procured for me from his friend, Mr. Bevington, and his brother, Mr. Newman, of Bermondsey, in Southwark, the following interesting particulars respecting the leather-dressing business.

"'I have just received your letter of the 20th inst. (January, 1810,) making inquiry respecting putrid, contagious, and low fevers, as affecting the workmen employed by leather-dressers, to which I can give you a pretty clear reply. Our men are generally healthy, and the most so of the labouring poor—many have been in our service and knowledge fifteen and twenty years, and I do not recollect one case of the kind occurring (in our establishment) in London. The first process in dressing is to put the skins into a pit of water to soften them, which is often used two or three times, that is, for two or three parcels, before it is changed, until the stench is intolerable. After this process the skins are struck out over a beam, and hung up, side by side, as close as possible, in a small room excluded from external air, which we term a stove: in this state they remain until they heat and slime, so that we can pull off the wool. The process of putrefaction is here so rapid as to disengage large quantities of volatile ammoniac, affecting the eyes of strangers with tears, and their noses with the most offensive smell. Our men always pull the skins in the stove in cold weather from preference, and are occupied in it a whole day at a time without injury.' Another gentleman, a brother of Mr. Newman's, concerned in the leather-dressing trade, but not in the same house, in Bermondsey, informs him, 'that so far from our workmen being unhealthy, or particularly subject to fevers, the reverse is the fact—the men employed look generally robust and healthy. In a concern in this line of business of fifty years standing, in which fifty men are constantly employed, the men have been uniformly healthy; and in this a circumstance is deserving of notice, viz. the men who work upon the raw skins, from which there is a constant and profuse exhalation of putrid steams, and those employed at the lime and tan-pits are equally healthy.' Mr. Newman, the writer of the above, says there are about sixty leather-dressers' and tanners' yards in Bermondsey, and in them about seven hundred men are constantly employed.

"It may, perhaps, be objected to this account, that the business of leather-dressers, in other countries, had been represented as extremely unhealthy. Hippocrates is supposed to have meant something of this kind as the cause, when he mentions the case of a person, Philiscus, *residing near the wall*, who died on the 6th day of a malignant fever; (Epidemic. lib. 1. s. 3.;) for anciently, and now, indeed, offensive trades of this kind were carried on in the suburbs, παρα τω τειχει of cities. This was the case at Rome, beyond the Tiber, and some of the Latin poets have exercised their wit in allusions to it. It is highly probable, however, that the real cause naturally existed in the spot itself set apart for the 'sordidiores artes,' and that what was attributed to them proceeded from the marshy nature of the soil. Certain it is, without recurring to this explanation, we cannot reconcile Mr. Bevington's and Mr. Newman's, two respectable living witnesses, with the testimony of Ramazzini and Mercurialis, Martial and Juvenal, as quoted by him; and there is sufficient evidence that the Transtiberina Regio of Rome, and the Paduano (once, 17th century, male sanus, bestiis quam hominibus aptior) were proverbially unhealthy from their marshes, and that Bermondsey is not. *See Ramazzini, De Morb. Artific. cap.*

*15.; and Annotat. in Lib. Lud. Cornelii, Veneti de Vit. Sobr. Commodis; and de Virg. Vestal. Valetud. tuend. Dissertat.**

"5. I borrow the following singular fact from the ingenuous and experienced Ramazzini. 'In hac civitate, (Modena,) quæ pro suo ambitu satis populosa est, ideoque domos confertas habet ac prealtas, mos est ut tertio quoque anno in singulis domibus cloacæ expurgentur, quæ per vicos discurrunt. Cùm ergo domi meæ id opus fieret, contemplatus unum ex operariis istis in antro illo Charonæo magnâ anxietate ac sollicitudine opus suum peragentem, miseratus tam improbi laboris, ipsum interrogavi, cur tam sollicitè laboraret, et non pacatius id ageret, ne ex nimio labore in multam lassitudinem incideret, tunc miser ex antro illo oculos attollens, meque intuitus: nemo, inquit, nisi expertus, imaginari potest, quanti constet, plus quàm quatuor horis in hoc loco morari, idem enim est cæcus fieri.—Rursus ab eodem quæsivi, num in faucibus ardorem ullum persentiant, difficultatem aliquam respirandi patiantur, capitis dolore tententur, num odor ille nares percellat; nauseam pariat; nihil horum respondit ille, neque pars ulla in hoc opere mulctatur, præter oculos.'—This account was afterwards confirmed by his observing a number of these people reduced to blindness and beggary. 'Oculis tamen solummodo, bellum tam atrox indicunt fœtidæ exhalationes istæ, ac illos acutissimis spiculis sic feriunt, ut illis vitam, id est lumen, eripiant.' Thus, as certain acrid substances seem exclusively to affect different and distinct parts of the body, as cantharides the bladder, the torpedo the nerves—'sic halitus illi ex humanis fæcibus per varios corruptiones gradus trium annorum spatio, talem adsciscant naturam, ut oculos tantùm lacessant, cæteris vero partibus ignoscant.' (*De Morb. Artific. cap.* 13.) This fact is no less important than curious, as it tends to show the inconsiderate conclusions of some eminent writers respecting the influence of the exhalations of privies on the health of men. Sir John Pringle often attributes the epidemics of camps to this as a cause; but it is fair to believe that he did so, without allowing himself sufficiently to investigate the subject. The tendency of this fact, too, goes to the overthrow of some of the bold, and, I am inclined to think, hasty, assertions of Dr. Miller, relative to the locality of the cause of the pestilential fever of New York, in 1805; for what is 'the blast of putrid exhalations from the sewer of Burling-slip' to the 'halitus ex humanis fæcibus per varios corruptiones gradus trium annorum spatio' of Modena? (*See Edinburgh Med. and Surg. Journal, vol.* 3. *p.* 252.) Now, whether the effect of these exhalations is asphyxia at Paris, according to Sauvages, (*Nos. Meth.*

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* My Essay on the Malignant Pestilential Fever may also be consulted with illustrative effect under the article of Martinico, vol. 2. p. 120—123.; under St. Lucia, ibid. p. 183.; under Demerara, ibid. p. 200.

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vol. 1. *p.* 820.) or amaurosis at Modena, according to Ramazzini, in either case there is ample proof that they cannot be productive of putrid or pestilential fevers."

"Clavigero, on the authority of Torquemado, says, that at the dedication of the great temple of Mexico, anno 1486, 72,344 human beings, prisoners taken in war for the purpose, were sacrificed to the Mexican gods; and that a petty king or lord, about the same time, in imitation of his master, the emperor, sacrificed many thousands on a similar occasion. On the erection of the great altar at Mexico, more than 12,000 were offered up:—and the annual average of human creatures thus disposed of, amounted to 20,000, beside a prodigious number of quadrupeds and birds. Notwithstanding this dreadful waste of human blood—and notwithstanding the horrible stench always present in this quarter of Mexico, the diseases, among an immense population, some say six millions in the city alone, were trifling, and proceeded almost altogether from marsh miasmata. The bodies of the victims were precipitated to the bottom of the steps of the altar, there to putrefy; or were sometimes ate by the Mexicans; and a pond of water, situated close to the great temple, was continually tinged by the blood of the sacrifices. (*See History of Mexico, vol.* 1. *p.* 201. 232. 231. 426. *See, also, Herrara, decade* 3. *c.* 16.; *Prevost's Voyages, &c.*) The prodigious sacrifice of peace offerings, made by Solomon at the dedication of the temple of Jerusalem, may be compared, 1 Kings, viii. 63.

"The annals of Dahomy furnish numerous illustrations of the foregoing remark; a nation whose kings delighted in blood, who wanted heads, not slaves, to garnish their palaces continually stained with human gore, and whose 'annual customs' presented to the terrified European many thousand human beings, sacrificed to the manes of their ancestors—a barbarous oblation, founded on the wildest and most savage superstition, denominated by them, 'the watering the graves of the deceased royal family.' There are some remarkable instances of the savage cruelty of these natives of Guinea, given by Governor Dalzel, in his History of Dahomy, in which, if pestilence could be the produce of the putrefaction of animal bodies, we should expect to hear of the most direful pestilential epidemics; but in which no such result is even noticed. 'It being now noon, they sat down to dinner on the ham and fowls they had brought with them; but were so annoyed by flies, they could scarce put a morsel into their mouths, without taking in some of these vermin with it. They little thought whence this nuisance proceeded, else they would have made a much shorter dinner; nor was it till about 3 o'clock, when, being desired by a messenger from the great captain, to come to the king's gate, that on their way they perceived, with no small degree of disgust and horror, two heaps of dead mens' heads, piled up on two large stages, and covered with swarms of their late visiters, the flies. The interpreter told them, 'they were *the heads of four thousand* of the Whydahs, who had been sacrificed by the Dahomans to their god, *about three weeks before*, as an acknowledgment of the great conquest they had obtained.' The king of Abomey, Ahadee, lived in a kind of charnel-house, yet was healthy, and seventy years old when he died. Dalzel thus describes this singular palace: 'The author had once an occasion to pass the limits of the courts already described, when King Ahadee was sick, and would see him in his bed-chamber. This was a detached circular room, of about eighteen feet diameter. It had a thatched conical roof; the walls were of clay, and whitewashed within. There was a small area before it, formed of a wall about three feet high, the top of which was stuck full of *human jawbones;* and the path leading to the door was paved with *human skulls;* the area within was also paved with skulls, which, I understood, were those of neighbouring kings, and other persons of eminence and distinction, whom, having taken prisoners in the course of his wars, he had placed there, that he might, literally, enjoy the savage gratification of trampling on the heads of his enemies.'" *Edin. Med. and Surg. Journ. vol.* 6.

In another work of Dr. Chisholm, (*see his Letter to Dr. Haygarth, 8vo. London,* 1809,) he has the following important statement on the same subject.

"Among a number of facts to prove that putrefaction and filth did not give rise to the pestilence, I shall select the following. In the year 1781, a gentleman who managed the mercantile concerns of John Brown and Son, of Copenhagen, in St. Croix, received from them a cargo of provisions, which he, in expectation of higher prices, kept in his storehouses, until the stench from them incommoded the neighbourhood, and could be perceived in the street. A complaint was made to the master of police, who ordered the provisions, consisting of beef and pork, to be examined; and they were found in such a putrid state, that upwards of a thousand barrels were ordered instantly to be carried outside of the harbour, and sunk in the sea. No appearance of infection or of sickness of any kind appeared in the house, in the neighbourhood, or among the people employed in transporting the provisions. In the year 1786, I think, a Swedish brig came into the harbour of Christianstaëdt, in distress: she had suffered much at sea, was leaky, and in coming in struck on a reef at the entrance of the harbour, from being unmanageable. She was got off with difficulty, and brought into the carenage to be hove down and repaired. Her cargo, which consisted of coffee in bulk was in such a state as to be condemned as useless, and thrown on shore, where it rotted and formed a dunghill. This lay for several weeks near the carenage, which was frequented by sailors and people from different nations; and yet, though it was in the hot months, no sickness or infection was occasioned by it. It was finally removed through my remonstrances. Let this important fact, which, indeed, is confirmed by what happens every year on coffee estates in the West Indies, be compared to the singular assignment of the pestilence of 1793, by Dr. Rush, to the effluvia

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of damaged coffee. How baseless the fabric of his theory! About fifteen years ago a large whale, in a state of putrefaction, was driven on shore at the Estate Longford, in St. Croix. It was in summer, when the crop was over. The proprietor ordered large quantities of the blubber to be cut off, and boiled in his sugar coppers, to supply his numerous concerns with oil, and for sale. The negroes of the adjoining estates, likewise, supplied themselves with it. Yet none of them or of the white inhabitants were affected with any sickness, though the stench from the whale could be perceived at a quarter of a mile distant. To these I may add this general fact, that Danish ships have seldom arrived at St. Croix from Denmark, without having their provisions in a greater or less putrid state; but sickness has never been occasioned thereby." P. 252, 253.

It is also a proof of the innocence of dead animal matter and of the communication of the plague by a specific secretion from the living body, that the corpses of those who die of plague do not convey the disease.

"It is remarkable" says Mr. Howard, "that when the corpse is cold of a person dead of the plague, it does not infect the air by any noxious exhalations. This is so much believed in Turkey, that the people there are not afraid to handle such corpses. The governor at the French hospital in Smyrna told me, that in the last dreadful plague there, his house was rendered almost intolerable by an offensive scent, (especially if he opened any of those windows which looked towards the great burying ground, where numbers every day where left unburied;) but that it had no effect upon the health either of himself or his family. An opulent merchant in this city likewise told me, that he and his family had felt the same inconvenience, without any bad consequences." *Howard on Lazarettos, 2d ed. Lond. 4to, page 25.*

Rondeletius, as quoted by Sennertus, asserted that he had dissected bodies dead of the plague in presence of many of his pupils with perfect safety. Much interesting information on this subject will be found in the first volume of Dr. Ferriar's Medical Histories and Reflections. Dr. Ferriar remarks,

"It is a general opinion, that pestilential disorders are occasioned by the effluvia of dead bodies, but there is reason to question the truth of this. When plague has appeared, in the neighbourhood of places where many bodies had remained unburied, after general engagements, other causes can be pointed out as more likely to have produced it. But many instances can be produced in which thousands of dead bodies have been left to putrefy on the field of battle, without causing pestilential distempers. This was not unnoticed by the attentive Diemerbroek. 'Cadavera, sive hominum,' says he, "sive aliorum animalium putrescentia pestem non generare, docent multæ magnæ strages, in quibus talis cadaverum inhumatorum putrefactio nullas pestes induxit. Anno 1642 in

agro Juliacensi, maxima strages facta est, et ad minimum 8000 militum, occisa fuerunt præter majorem adhuc famulorum, rusticorum, aurigarum, puerorum & mulierum numerum, atque equorum copiam innumerabilem; corpora inhumata sub dio computruerunt, nulla tamen pestis insecuta est. Hic in Germania, durantibus his nostri ævi crudelissimis bellis, etiam plurimæ maximæ strages factæ sunt, post multas tamen illarum nulla peste subsequente.' (P. 31.) These facts are strengthened by a well-known circumstance, that in no case could the origin of a putrid fever be ever traced to the effluvia of dead bodies in a dissecting room. Nor have fevers been observed to originate, or to rage more severely in houses surrounding church-yards, in the middle of large towns, though the stench of the putrid bodies, over-heaped in such receptacles, is often insufferably offensive."

It has also been stated, that decomposed *vegetable* matter is not, as contended for by many physicians, the cause of yellow fever. The following fact, stated by Dr. John Stewart, of Grenada, abundantly proves that *vegetable* filth has no more agency in the production of that peculiar type of fever than putrid animal substances. "That vegetable and animal matters in a state of putrefaction do produce disease is not to be denied; but that vegetable matter in a state of corruption is, on many occasions, harmless, is evident, from the very offensive heaps of cotton-seed, and the pulpy covering of the coffee-berry, which are daily to be met with in Demerara, without being considered as a cause of fever; nor should this circumstance be omitted, that when fever does prevail, it is at a season when those causes do not act powerfully." *See Observations on the Nature and Treatment of the Malignant or Yellow Fever which prevailed in the island of Grenada, (W. I.) in the years* 1793, 1794, *and* 1795, *in a Letter to David Hosack, from John Stewart, M. D., &c. &c. Amer. Med. and Phil. Register, vol.* 3. *p.* 183.

It may also be remarked as an additional testimony to that stated by Dr. Stewart, to prove that the yellow fever does not derive its origin from decomposed vegetable matter, that whenever that disease has prevailed in the United States, it has not appeared in the country where such vegetable matter is most abundant; but has been chiefly confined to our largest cities, and those towns which are situated on the seaboard; a fact totally inexplicable upon the principle that the yellow fever is the product of vegetable putrefaction. I am fully aware the opinion has been entertained that this form of fever prevails in the interior of our country, and especially in the vicinity of the lakes; but whoever will consult the statements furnished by physicians residing there, and who have had the best means of obtaining correct information, will find ample refutation of that opinion. *See Frisbre's Sketch of the Medical Topography of the Military Tract of the State of New-York; and Brown's Sketch of the Country watered by the Mohawk River, &c.*

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Amer. Med. and Phil. Register, vol. 4.; Needham's Sketch of the Medical Topography of Onondaga, state of New-York. See Barton's Med. and Phys. Journ. 1st supplement.

But we need not confine ourselves to European writers for information on this subject. Similar facts have been observed in our own country, and in this city in particular, and equally show the absurdity of resorting to vegetable or animal putrefaction as the source of the malignant fever with which the United States have been recently visited.

Adverting to the condition of the city of New-York anterior to the American revolution, and before a regular system of police regulations was adopted; to the offensive state of the town during the revolutionary war, when inhabited by the British troops; to the immense collection of foul materials of every sort in the cellars of the numerous buildings destroyed by the great fire of 1776, during the whole of which period this city enjoyed a total exemption from the pestilential fever, we must be convinced of the limited and incorrect views of those who look no further for the origin of this evil. In like manner, the offensive state of our slips, our wharves, and our market-places, until within a very few years; the putrefactive processes attendant upon our tanneries, morocco, starch, and glue manufactories, slaughter-houses, tallow-chandleries, sugar-houses, &c. &c. the filthy and neglected condition of our streets, and, we may add, of many of our burial grounds, furnish incontestible evidence that these are innocent when considered as the *primary* causes of the mortal epidemics which have desolated our cities. The influence of such an impure state of the atmosphere, resulting from these various causes, as a *secondary* agent in multiplying and diffusing the poison of fever when introduced, has already, I trust, been made sufficiently manifest.

Mr. Howard, in his remarks on the plague, (*see History of Lazarettos, p.* 43.) adverting to the opinions of those who questioned the contagiousness of that disease, asks, "Have not some of our professors sullied their names with such dangerous doctrines? From no other cause," he continues, "than the error of physicians, who constantly maintained that the disease, then epidemic, was not contagious, happened that terrible visitation which, in 1743, ravaged the city of Messina and its vicinity, with the loss of above forty-three thousand individuals, in the short space of only three months."

May it not with equal propriety be asked, can the physicians of the United States, who shall carefully have reflected upon the facts which have just been stated, and others of a similar nature which might easily be adduced, persist in the belief they have expressed, that the pestilential fever that has appeared in our cities and seaport towns is the product of decomposed animal and vegetable matter?

NOTE F. (*See page 226.*)

The following cases, selected from those referred to in the text, illustrate, in the most satisfactory manner, the specific nature of the contagion of the yellow fever, at the same time that they show that this disease is occasionally communicated from person to person, even in the pure air of the country.

Facts relative to the contagious nature of Yellow Fever, in the pure air of the country. In a letter addressed to David Hosack, M. D. from the right Rev. Dr. Richard Channing Moore.

Staten-Island, October 20, 1806.

DEAR SIR,

The discordant opinions which are held by physicians of the first reputation, upon the subject of yellow fever, have prevented me from replying to your letter of January last, lest the information which I may offer should give rise to such observations as would necessarily involve me in a medical controversy. From frequent conversations with my worthy preceptor, the late Mr. Richard Bayley, as well as from the perusal of those tracts which had fallen under my notice, I for many years entertained the opinion, that the yellow fever, which has proved a scourge to our cities, originated exclusively within their enclosures, and was confined to the impurity of their immediate atmosphere.

One of the first circumstances which excited in my mind an impression of the infectious nature of the disease, and which induced an alteration in my views, was the illness and subsequent death of Dr. Wynant and his wife. This gentleman had been called to take the charge of a man from New-York, ill with yellow fever, upon the north side of this island. The doctor, after an examination of the case, judged it expedient to bleed his patient, and while engaged in the performance of that operation, the man was seized with violent puking, and discharged the contents of his stomach upon his physician's clothes.

From the appearance of the matter so discharged, Dr. Wynant expressed his apprehensions with respect to his own safety; he continued, however, his attendance faithfully until the patient expired. A few days after the death of the person alluded to, Dr. Wynant was taken seriously ill; the usual remedies were applied, from the use of which he imagined himself relieved, and expressed a conviction of his recovery. At this moment he was visited by Dr. Henderson and myself. When we entered his room, which was a fine, airy, comfortable apartment, he declared to us his expectation of being restored in a little time; the danger of the disease he concluded to be completely removed, and he was then in the use of bark and wine. His wife, an amiable woman, was sitting at his bed side, to all appearance in full health, elated with the prospect of her husband's recovery. She, however, soon discovered that her hopes were premature: the next day the companion of her bosom was wrested from her arms by that fatal disease, the force of which she had flattered herself was subdued.

Upon the day in which the doctor died, which was the 13th of October, '99, Mrs. Wynant was attacked with the same fever which had terminated the life of her husband, and within the space of five days from its commencement she fell a victim to its malignant, deadly influence.

About three years have elapsed since I was called to visit, in consultation with Dr Halsey, the son of a favourite parishioner, who was ill with yellow fever, which disease he had contracted in the city of New-York. The day preceding the dissolution of the young gentleman in question, it was necessary, in consequence of a copious involuntary discharge of urine, to change the sheets upon his bed, and whilst the disconsolate father raised the body of his son, I supported his drooping head upon my shoulder. The patient died; I performed his funeral rites, and in a few days was attacked with the disease myself. During my confinement and convalescence, I was visited by several of the faculty. Dr. Bainbridge of New York was at my house, who expressed his conviction of the serious nature of the disease, from which I was then recovering. It must be remembered that I had not been in the city for *many weeks* preceding my indisposition, and that the young gentleman from whom I received the complaint was confined in an airy, well ventilated chamber, surrounded with every comfort which the tenderness and opulence of his parents could procure.

In addition to the instances above mentioned, I have been informed by Mr. Abraham Banker, a gentleman of learning and intelligence, of the death of Mr. Degroat and his wife. It appears that a person from the city of New-York, by the name of Oswald, had engaged lodgings for himself and family at the house of Mr. Degroat, an opulent farmer upon the north side of this island. Mr. Degroat went to the ferry with his wagon to escort the strangers to his house; and upon his return home, rode next to Mr. Oswald, with whom he was engaged in close conversation. A few days after the arrival of Mr. Oswald, Mr. Degroat was seized with the yellow fever, to which he very soon fell a victim. Mrs. Degroat, who had affectionately attended her husband, was also attacked, and after struggling with the disease a few days, she followed her late companion to the tomb. Mr. Oswald, from whom, Mr. Banker is convinced, the contagious effects of the disease were received, added another to the list of mortality in that family; so that in the space of ten or twelve days, from the arrival of those fugitives from the city, the house was swept of three of its inhabitants.

In the preceding narrative, I have related such facts as have occurred in the circle of a few miles, and I leave you at full liberty to make such use of them as you may deem expedient for the public good. To resist the force of truth cannot be the object of any individual of the faculty of medicine: the learning and the talents of our medical brethren must render them superior to every sinister consideration, and I feel persuaded that their united wish is to advance the health and happiness of their fellow creatures, and to diffuse a light upon a subject, of which, to say the least, the views of physicians are extremely imperfect.

Accept, dear, Sir, the assurances of my regard, with which my mind is impressed toward you, and believe me to be your friend and humble servant.

Dr. D. Hosack. RICHARD CHANNING MOORE.

Statement of Facts tending to prove the contagious nature of the Yellow Fever, at Germantown, in the year 1798, by C. Wistar, M. D. Professor of Anatomy in the University of Pennsylvania, &c.

The disease which produced the fatal effects now to be related, commenced in the family of Elizabeth Johnson, a widow who lived in the main street of the village of Germantown, about six and a half miles from Philadelphia.

The person first affected was her child, Betsey Johnson, who had been in Philadelphia from the third to the seventh of August, in a neighbourhood where several cases of the fever had already appeared. She returned home the seventh, and on the ninth of the same month was attacked with the yellow fever, which terminated fatally in four days,

Fourteen days after her death, viz. August 27th, Mrs. Duy, the next neighbour of Mrs. Johnson, who had visited Betsey several times during her illness, was attacked with a fever supposed to be of the same kind, and died at the end of four days.

On the thirtieth of August, the wife of Charles Hubbs, who also lived near to Mrs. Johnson, and had visited both Betsey and Mrs. Duy, once at least during their respective indispositions, *but had not been in Philadelphia for many months*, was attacked with unequivocal symptoms of the yellow fever, in its most malignant form, and died the 2d of September.

Mr. Duy, husband of the above-mentioned Mrs. Duy, was attacked sixteen days after the death of his wife, viz. September 18, and died also, after an illness of six days.

A few days after the death of Mrs. Duy, an English gentleman and his wife, of the name of Fisher, who had fled from Philadelphia on account of the fever, went to board with Mr. Duy, and were placed in the chamber occupied by his late wife during her illness: they were also attacked with fever. Mrs. Fisher was taken, September 19th, and recovered in a few days, but Mr. Fisher, who was attacked four days after his wife, died with the black vomit, the 27th of September.

At the same time, the disease re-appeared in Mrs. Johnson's family, in a young female servant, who was very ill, but recovered. Soon after the attack of this girl, Mrs. Johnson herself was taken ill with the same disease: she had visited both of her neighbours, Mrs. Duy and Mrs. Hubbs, while they were sick, she also had assorted the clothes of her deceased daughter, four or five days before her own attack commenced, but had not been in Philadelphia for a month. Her disorder continued eight days, and terminated the 28th of September, with convulsions and the black vomit.

A few days before the death of Mrs. Johnson, Elizabeth Stern, a woman who lived in the family, was attacked with fever, and became very yellow. Her symptoms appeared moderate at first, but after lingering a fortnight she also died.—The wife of a tenant of Mrs. Johnson, who lived in a separate part of the house, but used the same yard, was attacked before the death of Elizabeth Stern, and recovered with great difficulty.

The last victim to be mentioned, was one Stephen Post, an old man, who lived at a distance, but worked in Mr. Duy's barn, while the bed was there on which Mrs. Duy died. He was also attacked with fever, and died in a few days.

These melancholy circumstances occurred in a village which has long been remarkable for its salubrity, at a time when the other inhabitants enjoyed their usual health. In most of the cases, the disease appears to have been contracted at the house of Mrs. Johnson, which, before this distressing period, had been eminently distinguished by the health and longevity of its inhabitants. The family were extremely neat, and it may be asserted with confidence, that the premises were never more clean than they were at the time of this truly affecting catastrophe. What cause but contagion is adequate to the production of such a disease among persons so situated?

Philadelphia, Dec. 15, 1805.

NOTE G. (*See page* 229.)

The following statement fully illustrates the principle, that those who are accustomed to breathe an impure air frequently escape disease, while those who from their better condition in life enjoy the more pure atmosphere, are readily attacked with contagious fever when exposed to its exciting cause.

"The most pernicious infection," says Lord Bacon, "next the plague, is the smell of the jail, when the prisoners have been long, and close, and nastily kept; whereof we have had in our time experience twice or thrice, when both the judges that sat upon the jail, and numbers of those who attended the business, or were present, sickened upon it and died. Therefore, it were good wisdom that in such cases the jail were aired before they be brought forth." *Nat. Hist. exp.* DCCCCXIV.

In Stowe's Chronicle a more particular account is given of the same circumstances, as occurring at the fatal assizes held in the year 1577, in the following words: "On the 4th, 5th, and 6th days of July were the assizes held at Oxon, where was arraigned and condemned Rowland Jenkins for a seditious tongue; at which time there arose amidst the people such a damp, that almost all were smothered. Very few escaped that were not taken. Here died in Oxon three hundred persons; and sickened there, but died in other places, two hundred and odd." "Of the same kind of infection," says Sir John Pringle, "we have an unhappy instance so fresh in our memory, that I needed not to have mentioned it here, had it not been for such as live at a distance, or those who are to come after us. In the year 1750, on the 11th of May, the sessions began at the Old Bailey, and continued for some days; in which time there were more criminals tried, and a greater multitude was present in the court, than usual. The hall in the Old Bailey was a room of only about thirty feet square." "The bench consisted of six persons, viz. the lord mayor, three of the judges, one of the aldermen, and the recorder, whereof four died, together with two or three of the counsel, one of the under-sheriffs, several of the Middlesex jury, and others present, to the amount of above forty; without making allowance for those of a lower rank, whose death may not have been heard of; and without including any that did not sicken within a fortnight after the sessions."

Similar instances of infection are related to have taken place at the Black assizes, at Taunton, and at those of Exeter, in 1586. *See Rees' Cyclopædia*, art. *Contagion*.

Facts of a like nature have fallen under the notice of that accurate observer, Sir Gilbert Blane. An extract from his letter on this subject is here inserted.

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Extract of a Letter from Sir Gilbert Blane, M. D. &c. to the Hon. Rufus King, Esq. Minister at the Court of St. James from the United States of America, dated

London, 26th November, 1798.

Sir,

I sit down to perform the promise I made you this morning, of putting on paper some remarks on the nature of the yellow fever, and the means of preventing it.

In doing this I shall chiefly confine myself to those views of it in which the magistrate is concerned. The adopting of measures for the prevention of disease is one of the most important duties of a wise and patriotic government; and the discovery of these means, as well as the efficiency of the steps to be taken, must depend on a thorough knowledge of the causes by which it is excited and influenced. My opportunities upon actual service in the West Indies in the late war, when physician to the fleet under the command of Lord Rodney and Admiral Pigot, and my present official duty as a member of the Medical Board of the Navy, have necessarily brought to my knowledge a number of facts relating to this subject, and I shall be extremely happy if the communication of some of the most important of them can throw any light, which may prove useful to the American government in checking an evil so afflicting and calamitous.

The first question that occurs with a view to preventive measures is, whether this disease be infectious, and under what circumstances it is so?

In those situations in which I observed it in the West Indies it was evidently so. There was the most incontestible evidence of this, both on board of ships and at hospitals, and the doubts which have been started on this point, seem to have arisen from the operation of infection being blended with that of other causes, which must concur with it in order to give it effect.

But whatever doubts there may be on this subject in the West Indies, there can be none in the climate of North America. This will be best proved and illustrated by an example.

On the 16th of May, 1795, the Thetis and Hussar frigates captured two French armed ships from Guadaloupe on the coast of America. One of these had the yellow fever on board, and out of fourteen men sent from the Hussar to take care of her, nine died of this fever before she reached Halifax on the 28th of the same month, and the five others were sent to the hospital sick of the same distemper. Part of the prisoners were removed on board of the Hussar, and though care was taken to select those seemingly in perfect health, the disease spread rapidly in that ship, so that near one third of the whole crew was more or less affected by it.

This fact carries a conviction of the reality of infection, as irresistible as volumes of argument; and it further affords matter of important and instructive information, by proving that the infection may be conveyed by the persons or clothes of men in health. *Blane's Diseases of Seamen, p.* 605—607. *3d edit.*

The principle which we have endeavoured to illustrate relative to the operation of febrile infection upon individuals unaccustomed to its influence has, in several instances, been strikingly exemplified by circumstances which have occurred in the debtor's prison, and in the bridewell of New-York. The following memorandum, made at my request by Dr. J. W. Francis, is in point on this subject.

"In the month of September, 1811, a febrile disorder of the typhoid character made its appearance in the debtor's prison of this city: its origin was owing to causes similar to those which usually produce a vitiated state of the atmosphere in confined apartments, the want of pure air, and the crowding of a large number of persons together, &c. &c. The contagion thus engendered was observed to operate with peculiar severity upon those individuals who were suddenly introduced into this vitiated air. About the 16th of July, 1814, several cases of the *typhus carcerum* occurred in the bridewell of New-York. The disease was first observed to exist in an apartment of the institution commonly called the eastern wing, a room about fifty feet long and twenty-five broad. Within a very few days after, the complaint became more general; and out of eighty-five individuals at that time confined in this part of the building, nearly forty were taken ill with symptoms characteristic of typhoid fever. The disease, in this instance, as in the former, was produced from the local circumstances of the place; the crowded condition of the ward, the want of cleanliness about the persons and in the clothing of the prisoners, and the neglect of free ventilation. The increased impurities of the atmosphere of the apartment seemed to give additional activity to the virulence of the disease: of the persons thus affected a large majority were those who had come from a pure air, and were but recently subjected to the noxious air of the place, several not more than thirty or forty hours, and many not more than three or four days. The infection was more readily communicated to those, too, who were naturally possessed of vigorous and robust constitutions, and its effects were, in most cases, more violent upon persons of this description than upon others. That the sphere of the infection was confined within certain limits, as affirmed by Dr. Lind of the malignant fever at the naval hospital at Haslar, and lately most satisfactorily shown by induction from well-attested facts concerning typhoid infection in general, (*see Letter of Dr. Haygarth to Dr. Percival,*) was abundantly manifest from the healthy condition of the prisoners in other apartments of the bridewell. The progress of the disease, which I have thus briefly noticed, was arrested by the removal of the sick, and the materials impregnated with the morbific poison; by the introduction of pure air, by ablution, and by other means now most generally had recourse to for the purification of fever-wards and houses of recovery, as recommended by Dr. Ferriar.

"It has again and again been observed, by the keepers of our prisons, that those criminals who have long been accustomed to breathe the vitiated air of the crowded apartments of these institutions very frequently escape febrile contagion: the poison itself might, at first view, appear to have lost a portion of its virulence; but it has with more propriety been maintained that the individuals thus inured to its influence are, from habit, exposed to it with impunity; while, on the other hand, the reverse is the case with the unassimilated, when subjected to the operation of an impure air, deriving its noxious properties from concentrated human effluvia. It is a remark of most writers, that the infection of typhus, whether occurring in jails, ships, or elsewhere, becomes concentrated, and, consequently, more active by the cold of winter. This opinion is strengthened by the well-known fact, that a greater number of deaths takes place from fevers of this nature, in our prisons, during the winter than in the summer season."

NOTE H. (*See page* 232.)

I HAVE expressed the belief that the changes which the atmosphere undergoes during the prevalence of certain pestilential disorders are ascribable to a fermentative or assimilating process. I am strengthened in this opinion, which I have for many years maintained, by the recent and elaborate investigations of MM. Gay-Lussac, De Saussure, and other distinguished chemists, which have thrown much light upon the subject of fermentation, and also by some interesting observations lately published in the Edinburgh Review. *See Edinburgh Review for April*, 1814.

For a perspicuous elucidation of the manner in which the poison of diseases of specific contagion operates upon the human constitution, in assimilating the mass of fluids to its own peculiar nature, the reader may consult an Essay lately published by Dr. J. W. Francis, Professor of Materia Medica in the University of the State of New-York, and inserted in the American Medical and Philosophical Register, (*vol.* 4. *p.* 474—519;) also a valuable Dissertation on the Pathology of the Human Fluids, by Dr. Dyckman, of New-York.

NOTE I. (*See page* 233.)

There is scarcely to be found on record a series of facts which so conclusively prove the specific character of the pestilential or yellow fever, or points out the circumstances under which it is propagated or extinguished, as those referred to in the text: *e. g.* we have seen this disease introduced at the Wallabout on Long Island in the summer of 1804; and the poison diffusing itself in that neighbourhood as far as the impurity of the air extended; while the same disease conveyed, from the Wallabout into the city of New-York, was instantly extinguished by means of the relative purity of the atmosphere, the effect of the rigid system of police then observed. *See American Med. and Phil. Register, vol.* 2.

In like manner, in the summer of 1809, (*see Statement by Dr. Gillespie, Amer. Med. and Phil. Register, vol.* 1.) the yellow fever was introduced and spread in the village of Brooklyn, Long Island; at the same time that the city of New-York, within eight hundred yards' distance, enjoyed the most perfect exemption from it; a fact which at once disproves the dependence of yellow fever upon a general constitution of atmosphere which many physicians believe to be necessary both for the origin and propagation of this form of fever. We are led to the same conclusion by a perusal of the report relative to the introduction of the yellow fever into the city of Amboy, New Jersey, in the summer of 1811. *See Amer. Med. and Phil. Register, vol.* 3.

NOTE K. (*See page* 234.)

The following extract of a letter from the Rev. Dr. Samuel S. Smith, the late president of Princeton College, shows that the fact I have stated of an interval taking place between the first and the subsequent cases of fever is of so frequent occurrence, that it even attracts the notice of those who are unconnected with the medical profession.

Princeton, July 24th, 1808.

Dear Sir,

I have not any doubt but that yellow fever contains a specific contagion, essentially variant from that of small pox, with which it has so often been compared in order to

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deny contagion being incident to it. It requires a certain putrid state of the atmosphere as a conductor, in order to impart it: and it may inoculate and assimilate any confined portion of atmosphere which has been exposed to the requisite causes of contamination, so that every part of it shall have power to communicate the poison. In the pure atmosphere of the country the poison is commonly so diluted, that it is too weak to excite the fever, except under peculiar circumstances.

In every instance in which yellow fever has been introduced into Philadelphia one circumstance has invariably taken place: after the persons who have first taken the disease have either died, or recovered, there has been *an interval of health* for several days, usually from ten to thirteen or fourteen, before the alarm has been renewed. From this circumstance, I have concluded, that during that space of time the infection secretly works in the blood before it appears in fever. Often there is a second interval of apparent health, but not of so long continuance. I hope that your view of the subject will carry more conviction with it than we have hitherto perceived; and I hope it will even contribute, among the more sensible part of the profession, who do not think merely by authority, to unite jarring opinions, and to settle common principles.

SAMUEL S. SMITH.

By physicians who have recorded our epidemics such interval has been repeatedly observed. In Dr. Caldwell's Essay on the Yellow Fever of Philadelphia of 1805, it is very circumstantially noticed by that ingenious and able writer.

NOTE L. (*See page* 236.)

In the official document of the Board of Health of New-York, published on the 14th of September, 1805, they thus addressed the inhabitants of this city: "The board have formed a decided opinion, that the principal seat of the prevailing disease [the malignant epidemic fever] is that part of the city included between Burling-slip and Old-slip as far west as Pearl-street. Almost all the cases of disease which have occurred, can be distinctly traced to a communication with that part of the city. It is a matter of extreme regret, that the repeated admonitions of the board, to remove from this quarter, have been disregarded by a number of individuals who have remained the self-devoted victims of disease and death. They conceive it their duty again to enjoin it upon their fellow citizens, who have continued there, to remove immediately." Again, and in the same address: "All persons who do not comply forthwith with this advice of the board, to remove from the above described part of the city, which is deemed the principal seat of the disease, and which does not contain more than thirty-three acres, will be considered guilty of a wanton exposure of their lives, and will justify the board in resorting to compulsory measures." The epidemic fever which prevailed in Philadelphia in 1793 spread in a similar manner, according to Dr. Rush and others. "For a while," says Dr. Rush, "this fever was confined to the above-mentioned part of the city, but the disorder is spreading, and now appears in other places, so that several are affected in other parts of Water-street; some in Second-street; some in Vine-street; some in Carter's-alley; some in other streets; but, in most cases, the *contagion can be traced to Water-street.*" Proofs of the same kind might be taken from the most authentic accounts of the yellow fever as it has prevailed at other seasons, and in other cities and seaports of the United States: proofs wholly irreconcilable with the assertions of those who have declared that the malignant yellow fever arises at "distant and unconnected points;" that "no relation is observed between the source of the supposed contagion and the spreading of the disease to individuals or families;" and who have maintained that there "never was any successful attempt to trace, in regular series, the propagation of it to any number of persons from the first case, or from any single point of infection." *See Rush's Account of the Bilious Remitting Yellow Fever as it appeared in Philadelphia in 1793; Account of the Yellow Fever of New-London in 1798; Hardie on the Malignant Fever of New-York in 1805; Chisholm's Letter to Haygarth; Official Documents published by the Board of Health of New-York; Amer. Med. and Phil. Register, &c. &c.*

NOTE M. (*See page 237.*)

Hints on Purifying the Air of Infected Apartments, by the late Dr. T. Garnett, Professor in the Royal Institution, &c.

"If the air contained in a phial be rendered offensive by the putrid animal and vegetable substances, it may almost instantly be made sweet by dropping into the phial a few drops of *oxygenated muriatic acid;* or more effectually still, by introducing into it a small quantity of oxygenated muriatic gas.

"This experiment may be easily made; and it will be found that the air will, in this way, be deprived of the most putrid taint possible. Morveau and Berthollet have found, that if oxygenated muriatic gas be disengaged in a dissecting room, the bad smell from the subject will be corrected for a time; and that if the subject be washed with oxygenated muriatic acid, it will exhale no bad smell for a considerable time. These curious, but well-ascertained facts, naturally led us to inquire into the action of the oxygenated muriatic acid, in correcting the putrid effluvia.

"It is now well known, that almost all the putrid smells disengaged by putrefying substances, are owing to the extrication of inflammable air, or hydrogen gas, loaded with some or all of the three following substances, sulphur, phosphorus, or ammonia; and these substances do not give out any very disagreeable smell, except when dissolved in hydrogen gas; but in that state we know the smell to be very unpleasant.

"Sulphurated hydrogen gas, or hepatic air, smells very disagreeably; but the hydrogen gas in which phosphorus has been dissolved, often smells most intolerably, resembling the refuse of blubber. The superabundant oxygen of the muriatic acid unites with the hydrogen, and forms water; and the sulphur and phosphorus, being no longer in a state of solution, become concrete, and the bad smell disappears.

"Though it is not yet proved, it seems very likely, from the experiments of Mr. Wall, and others, that the effluvia from the human body communicating infection, is hydrogen gas, charged with some animal substances.

"Is it not natural, from analogy, to conclude, that if these were deprived of their solubility in hydrogen gas, they would become innocent? and may we not reasonably suppose, that the oxygenated muriatic gas will deprive them, as well as other putrid effluvia, of their solubility?

"It certainly, I think, deserves a trial, which may be made at a very small expense, in the following manner:

"Take an ounce of the black oxyd of manganese in powder, and mix with it a quarter of a pound of common salt; put this mixture into an earthen vessel, and place it upon a chafing dish of coals in the room where the person labours under an infectious complaint; then pour upon it two ounces of sulphuric (vitriolic) acid, diluted with the same quantity of water.

"Oxygenated muriatic acid gas will be instantly disengaged, and perceived in all parts of the room, and will at least destroy any putrid or offensive smell; and I am inclined to hope, that it will likewise correct the contagious effluvia.

"When this gas is extricated in too great quantity, it will excite a cough; but I think that will not be the case with the quantity I have mentioned; if it should, a less portion must be used, or the mixture may be made without heat; but we know that bleachers are continually inhaling this gas in considerable quantity, without any disagreeable consequences. I should think there could be no difficulty in doing it in the house of any poor person; but it certainly might be very easily done in a fever-ward."

As connected with the same subject, and illustrative of the condition of atmosphere produced by the introduction of an infectious ferment, and the means of destroying the noxious compound, I subjoin the following valuable communication from Dr. Samuel Bard, the venerable and learned President of the College of Physicians and Surgeons in the University of the State of New-York.

Hyde Park, July 27, 1808.

DEAR SIR,

I have read, with great pleasure, your arrangement and explanation of contagious diseases, and am, by your arguments, confirmed in the opinion of the agency of a ferment, *sui generis*, in the propagation of contagious and infectious diseases. I use these terms here indiscriminately: indeed, I believe the analogy between fermentation and its various products, and the progress and fomes of contagious distempers, applies more closely, and to a greater extent, than has been generally supposed.

For instance: under certain circumstances of heat and moisture, all vegetable and animal matters run into fermentation; that of vegetables passes through the stages of vinous and acetous to a species of putrefactive; that of animals likewise has its stages, as is evident in the fermentation of milk; and its products differ conspicuously, according as flesh, fish, fat, blood, or eggs are the subjects of it.

An increased degree of heat always increases the rapidity with which fermentation goes on; and other circumstances of the atmosphere, a greater or less degree of moisture and dryness, a violent storm, thunder and lightning, moonlight, and probably many other less evident causes combining with the heat, variously change, hasten, or retard the process of fermentation, as every person conversant with these subjects well knows.

Again, the different constitutions, (or, if you please, a certain predisposition in vegetable and animal substances,) have the same effect in hastening, retarding, and variously modifying the products of fermentation: thus rich vegetable juices readily assume, and stop at, the *vinous* stage, and with difficulty can be made to go on to the *acetous;* poor and crude vegetable juices can hardly be arrested at the *vinous* stage, but run *rapidly* into the acetous; and cabbages, and all vegetables of that class, can hardly be made to produce either wine or vinegar, but quickly run into a kind of *putrefactive* fermentation. *Fish* putrefies more readily than *flesh;* and there is a great difference in this respect between the flesh of different animals.

All these circumstances are hastened, rendered more certain, and variously modified, by the addition of a ferment; and, lastly, a certain degree of cold prevents all fermentation, and stops it where it has already begun. So it is with infectious epidemics; certain degrees of heat and moisture in the atmosphere are necessary to their production; high degrees of heat always increase the spread, and add to the malignancy, of the disease; filth, and other qualities of the atmosphere less known, vary their types and exalt their grades; the constitution of the patient renders him more or less susceptible of particular diseases; the addition of a ferment (which is found wherever the disease exists) most certainly communicates and characterizes it; and lastly, under certain circumstances of purity and temperature of the atmosphere, it is found almost impossible to propagate those diseases, even by the aid of a ferment; and this observation applies, in some measure, even to small pox, measles, &c.

The sentiment, therefore, which you express, and so well illustrate, that the contagious diseases of your third class, although they may originate in circumstances of heat, moisture, and filth, and some other less evident qualities of the atmosphere, yet are unquestionably, and with more certainty, produced and propagated by the introduction of a ferment characterizing the type and grade of the disease, is, I believe, strictly and literally true; and upon this opinion only can a well-regulated police and quarantine laws be founded. The question you ask, why A after visiting B, ill of dysentery, plague, yellow fever, &c. is seized with the identical disease of B, when you consider the universality of the fact, is decisive as to the existence of a peculiar virus, or fomes sui generis, producing that particular form of disease; and the observation of Sydenham, that the prevailing epidemic swallows up all other diseases, confirms it; and I think you treat the non-contagionists with too much lenity, when you say they differ from us only in terms: far from it; they differ in fact, and most dangerously so; for, by denying the generation of a peculiar ferment in and about the bodies of the sick, and the propagation of contagion from patient to patient, they deny the utility, and are led to the neglect of some of the most important precautions against the introduction, importation, and propagation of such diseases.

Your first class of contagious diseases is strictly and clearly defined; they can be communicated by contact only: is not the materies morbi of these diseases always generated within the body; and whether it consists of animalculæ, or a chemical mixt, are they to be found anywhere else?

The fact that the diseases of the second class are communicable at every season of the year, during the heat of summer as well as during the severest cold of winter, in a pure as well as an impure atmosphere, forms the best distinction between this class and the third. But in as far as it is true that none of the second class can be suffered more than once in a lifetime, I am almost led to conclude, that in these, too, the materies morbi can be generated only in the bodies of the sick: the first origin of these diseases, and their occasional re-appearance in places where they had not been seen for years before, I confess forms a difficulty, but I do not think a contradiction to this opinion; the materies morbi in these seems to be of a grosser nature, not so readily assuming a very elastic æriform state as that of the diseases of the third class; and hence the circle of contagion is much more restricted near the bodies of the sick.

Of the third class the fomes may certainly be, in some instances, in the first place generated in the atmosphere, and for that reason requires particular circumstances of heat, moisture, &c. but finding materials in the bodies of the sick to act upon, it readily assimilates a large portion to its own nature, which being very elastic and æriform, spreads to a wider extent, and contaminates the atmosphere, particularly a foul atmosphere, in which similar ingredients are found to a great extent.

Your's sincerely,

Dr. Hosack. SAMUEL BARD.

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No. III.

A Detailed Narrative *of the* Earthquakes *which occurred on the* 16*th day of December*, 1811, *and agitated the parts of North America that lie between the Atlantic Ocean and Louisiana; and also a particular account of the other quakings of the earth occasionally felt from that time to the* 23*d and* 30*th of January, and the* 7*th and* 16*th of February*, 1812, *and subsequently to the* 18*th of December*, 1813, *and which shook the country from Detroit and the Lakes to New-Orleans and the Gulf of Mexico. Compiled chiefly at Washington, in the district of Columbia. By* Samuel L. Mitchill, *Representative in Congress, &c.*

[Read before the Society on the 14th of April, and the 12th of May, 1814.]

The beautiful comet which travelled through the northern celestial hemisphere during 1811, had offered itself plainly to view until the approach of the following year. Its elements, as calculated by Nathaniel Bowditch, Esq. and his learned associates, have already been placed before the public eye.

The tremendous storm from the northeast, near the end of December, 1811, began to leeward, near Cape Hatteras, and swept the American coast to the banks of Newfoundland, doing great damage to navigation, and exhibiting some curious facts in the history of the atmosphere. The particulars of this furious and memorable tempest have been collected by myself; and are in readiness to be offered to the society at the first convenient time.

My present intention is to read to you the information I have gathered on another occurrence of those portentous days. I mean the phenomena of the earthquakes, which terrified the country about the same period, and which continued a long time afterwards.

On the morning of Monday, the 16th December, 1811, several shocks of earthquakes were felt at the city of Washington. The first of these happened at three o'clock; and in some houses was considerable enough to shake the doors and windows, and wake persons from their sleep. There were successive tremors. Tassels of curtains were seen to move; and pitchers of washing-stands were heard to rattle upon their basins. The sound was very distinguishable, and was believed by many to pass from southwest to northeast. The alarm was so great in some families, that searches were made from room to room, to discover the robbers who were imagined to have broken into the houses.

A second shock, though lighter, was experienced about six o'clock; and a third about eight.

A gentleman standing in his chamber at his desk and writing, in the third story of a brick house, upon the Capitol Hill, suddenly perceived his body to be in motion, vibrating backward and forward, and producing dizziness. Not suspecting at the moment that the uncomfortable sensation was caused by an earthquake, he examined his desk to know whether it stood firm. Finding that it did, he dropped his pen; and turning his eyes upward, discerned that the looking-glass, and other things hanging near him, were in a similar motion.

Another person was near a table placed beneath a mirror. Feeling a giddiness come upon him, he seized the table for support. The general agitation of the chamber and house ceased in about a minute; but the looking-glass, which was suspended in the usual manner, con-

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tinued to swing for some seconds longer. These observations, made by Messrs. Bigelow and Moseley, may serve as specimens of a multitude of phenomena of those kinds.

The atmosphere seemed to forebode some unusual occurrence. One of my most correct and respectable friends, declared in conversation, and stated to me in writing, that he made an observation of the sky about ten o'clock that night. It was quite calm. There was not a breath of wind stirring. The air was perfectly clear and free from clouds. Nevertheless, it was uncommonly dark, and the stars which appeared in every part through the gloom, were lurid and dim, and afforded little light.

In Richmond the signs of an earthquake were witnessed by many persons. At three o'clock on the same morning, (the 16th of December,) there were said to be three successive shocks; another about six; and a third about eight. Several people were impressed with a belief that thieves had entered their dwellings; and in one of the most elevated mansions, the bells were set a ringing in both the upper and lower rooms. The noise and concussion were supposed by some to proceed from east to west.

It was stated at Norfolk that two very distinct shocks were felt in that town and in Portsmouth; to wit, at three and eight o'clock in the morning of the 16th. Some clocks were reported to have stopped; the doors rattled; and articles hanging from the ceilings of shops and houses, swung to and fro, although a perfect calm prevailed.

At Raleigh (N. C.) several slight earthquakes were felt on the morning of the 16th December. The first happened between two and three o'clock, and was distinctly perceived by all who were awake at the time. Two others were reported to have occurred between that time and seven o'clock, but were not plainly observed, except by some members of the legislature, who were in the state-house, and were considerably alarmed at the shaking of the building.

From Georgetown, (S. C.) it was told, that several shocks had been experienced between the hours of three and eight, on the morning of the 16th. The inhabitants were much alarmed. The shocks were so considerable, that the parade-ground of the fort was said to have settled from one to two inches below its former level. A tub of water, standing upon a table in the barracks, was reported to have been overset by the jarring of the building. Another severe shock was felt two days afterwards, at noon.

At Columbia, (S. C.) the inhabitants were alarmed by repeated shocks. The first took place at half after two in the morning of Monday, which was represented as shaking the houses as if rocked by the waves of the sea. It was followed, after the cessation of a minute, by three slighter ones. At eight o'clock two others took place, and at ten, some slight ones. The South Carolina college appeared to rock from its foundation, and a part of its plaster fell; which so alarmed the students, that they left their chambers without their clothes. It seemed as if all the buildings would be levelled. The dogs barked; fowls made a racket; and many persons ran about with lights, not knowing where to go, so great was their terror. During the first agitation, it was observed, that the air felt as if impregnated with a vapour, which lasted for some time.

On Tuesday, at a quarter after twelve, another smart shock was experienced. At Laurens and Newbury, in the interior districts, it was so violent as to crack and start several chimnies.

At Charleston (S. C.) the sensation was of considerable strength. One account stated, that on the morning of the 16th, at a few minutes before three o'clock, a severe shock of an earthquake was felt. Its duration conjectured to have been between two and three minutes.

For an hour previous, though the air was perfectly calm, and several stars visible, there was, at intervals of about five minutes, a rumbling noise like that of distant thunder; which increased in violence of sound just before the shock was felt. The vibration of St. Philip's steeple caused the clock bell to ring about ten seconds. Two other shocks were felt afterwards, one a little before eight, and the other about a quarter of an hour after. Both these were slighter and shorter than the first. Many of the family clocks were stopped by the concussions. In many wells the water was considerably agitated. From another source it was related that Charleston was shaken by an earthquake severely, at the time before specified. This was preceded by a noise resembling the blowing of a smith's bellows. The agitation of the earth was such that the bells in the church steeples rang to a degree indicative of an alarm for fire. The houses were so much moved that many persons were induced to rise from their beds. The clocks generally stopped. Another slight shock was experienced about fifteen minutes after; and yet another at eight o'clock. This last one produced a considerable rattling among glass, china, and other furniture. A looking-glass hanging against a west wall was observed to vibrate two or three inches from north to south.

The ingenious writer of the meteorological observations for Charleston during December, 1811, has noticed these occurrences in a manner too interesting to be omitted. According to his remarks, there were seven shocks during the month, having a vibratory motion from east to west. In many persons the motion produced nausea. All the shocks, except the three last, were preceded by noises resembling the rattling of a carriage over a pavement. There had been less thunder during the preceding season than usual. The days of thunder amount annually to about sixty; but this year they were no more than thirty-eight.

The beautiful comet was visible in the northwest during the whole month.

The inhabitants of Savannah were sensible of four earthquakes. The first was on the morning of the 16th December, between two and three o'clock. It was preceded by a flash of light, and a rattling noise, resembling that of a carriage passing over a paved road. It lasted about a minute. A second soon succeeded, but its duration was shorter. A third happened about eight o'clock; and a fourth about noon on the 17th. Persons who experienced the hardest shock, were made to totter, as if on shipboard. Its course was believed to be from southwest to northeast.

It was observed, by Dr. Macbride of Pineville, (S. C.) that the earthquake terrified the inhabitants exceedingly. It was accompanied by several appearances that countenances the theory of this phenomenon, which brings in the agency of the electric fluid. 1. The unfrequency or absence of thunder storms; that is, they were much less frequent this year than usual, especially in the autumn. 2. Immediately before the earthquake, a red appearance of the clouds, which had much darkened the water for twenty-four hours immediately before the shock; and, 3. The loudness of the thunder, and the number of the peals within twenty-four hours after the first shock, and but a few hours before the last, which was felt before he wrote. Such thunder was very unusual at that season.

At Natchez, the occurrences, as related by a careful observer, were as follow: Four shocks were felt on the morning of the 16th. The principal one was at ten minutes after two, A. M. There was no noise, except in a few situations. Several clocks were stopped. Articles, in some instances, fell from the shelves. Plastered walls were sometimes cracked. The Mississippi was agitated as if the banks were falling in. The trees in the forests waved their tops. Many houses

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were shaken considerably. And things suspended on nails or pins swung backwards and forwards.

Information was forwarded from Tennessee, that the earth quaked so violently, as to throw down chimnies, in some places. Eighteen or twenty acres of land, adjacent to Piney river, suddenly fell down, and sunk so low, that the tops of the trees were on a level with the surrounding earth. Four other shocks were experienced on the 17th, and one or more continued daily until the 30th.

At Knoxville, the quaking of the earth on the 16th was represented to have lasted more than three minutes. The rattling of the windows and furniture of the houses were such as to awaken almost every family. This was about two in the morning. It was followed, in half an hour, by another, which continued half a minute. Between sunrise and breakfast, three others were felt, of only a few seconds in duration. At the end of the first and longest shock, there were, in a direction due north, two flashes of light, at the interval of about a minute, very much like distant lightning.

At Columbia, in Tennessee, between two and three o'clock on the morning of the 16th December, the inhabitants were suddenly alarmed by a violent agitation in the earth. It was accompanied by a peculiar sound, proceeding from southwest to northeast. Immediately after the shock had ceased, a very large volume of something like smoke was discovered to rise in the quarter whence the sound appeared to come; and pursuing nearly the same course, finally settled in the north, exhibiting the appearance of a black cloud. The shock was computed to have continued from ten to fifteen minutes.

At Louisville, (Ken.) near the falls of Ohio, on Monday morning about three o'clock, a violent shock of an earthquake was felt. It was judged to have continued about three minutes. This was followed by three or four others of less violence. A number of houses suffered

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considerable damage; the chimnies having been so much cracked as to require repairs by the mason. On the evening previous to the shock, there was a gentle rain, such as we have in April; and the night was rather close and dark; but at the termination of the first shock, it was light enough to enable a pin to be seen.

By information from Jeffersonville, in the Indiana Territory, on the opposite side of the Ohio, it was understood that the shocks were reiterated, and the writer of the account I am now copying, declares that the table was in motion from the earthquake, while he was employing his pen to describe the phenomena. The day preceding was extremely dark and gloomy there, and warmth and smokiness distinguished the weather for some time after.

At Vincennes, the earthquake occurred about two o'clock on the morning of the 16th December. Other shocks of less violence followed it for several days. It was so severe that the inhabitants were greatly concerned for the safety of their houses.

At the Red Banks, one hundred and fifty miles below Louisville, it was stated in a letter to my friend, the hon. Anthony New, dated January 4, 1812, "that there had been from twenty to thirty shocks of earthquakes at that place. They begun on the morning of December 16, at about half after two o'clock. The first one, and another at sunrise the same morning, were most violent indeed. We had to flee from our houses. Several chimnies were thrown down, and many others so wrecked and cracked as to be very dangerous. The noise which accompanied the several shocks is said to have come from the west."

The town of St. Louis, in Louisiana, experienced a full proportion of the commotion. Mr. Riddick, being at St. Louis, near the Mississippi, observed to me, that the shocks were preceded by a remarkable calm. The atmosphere was of a dingy and lurid aspect, and gleams and flashes of light were frequently visible around the horizon, in different

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directions, generally ascending from the earth. Sometimes sounds were heard, like wind rustling through the trees, but not resembling thunder.

The first earthquake was felt about a quarter of an hour after two in the morning of the 16th. It roused persons from their sleep, by the clatter of windows, doors, and furniture, in tremulous motion. There was a rumbling distant noise, resembling a number of carriages passing over a pavement. In a few seconds the motions and noises had considerably increased. The sky was obscured by a thick and hazy fog, without a breath of wind. The weather was moderate, with the mercury about eight degrees above the freezing point. At forty-seven minutes after two, a second shock was felt. At thirty-four minutes after three, a third came; which was as tremulous as the first, but not followed by so much noise. A little after daylight, there was a fourth; at eight, a fifth; and at half past eleven, a sixth; several persons felt, or imagined, others. They were of different lengths, from two minutes to a few seconds. No lives were lost; some chimnies were thrown down; and a few stone houses split. The morning was observed to be very hazy, and unusually warm for the season. The houses and fences seemed to be covered with a white frost; but on examination, this appearance was illusive. A vapour hovered over every thing, and shrouded the morning in awful gloom.

At Lebanon, in Ohio, the alarm was so great, that many persons forsook their houses. The vibration of the shocks seemed to be from east to west.

At Circleville on Monday morning between one and two o'clock, many of the inhabitants were considerably alarmed by a sudden and violent trembling of their houses, which was supposed to have proceeded from an earthquake. Many persons, affrighted, leaped out of bed. Another was felt at eight; but there was no explosion.

A letter from Kentucky to my friend, the hon. John Talliaferro, informed him that on the night between the 15th and 16th December, 1811, the shock of an earthquake was sensibly and alarmingly felt. The shakings continued, in greater or less degrees, through night and day, up to the 30th of the same month, when a more severe shock than any preceding one occurred. It overturned almost every brick or stone chimney in Henderson county, or the region thereof, situated on Green river, down to its confluence with the Ohio.

The editor of the Western Spy, a newspaper printed at Cincinnati, in Ohio, after writing an intelligent account of the phenomena of the earthquake, gave a valuable summary from the gazettes of the occurrences in other places along the western waters.

By the intelligence from Detroit, from Judge James Witherell, it appears that Michigan was agitated by the same subterranean power. A small shock was felt at Detroit on the 17th December. The atmosphere was serene, but cold. Thirty miles northwest of that village is a lake about nine miles in circumference, of an oval form, and which is supposed to have a communication under ground with Lake Sinclair. In the centre of this small lake there is an island of perhaps three miles in circumference, inhabited only by Indians. They relate, that on the said 17th December the waters of the lake appeared to tremble, and boil like a great pot over a hot fire; and immediately a vast number of large tortoises rose to the surface, and swam rapidly to the shore, where they were taken for food.

The testimony of Colonel Samuel Hammond, in a letter of the 6th February, 1812, which I received from him, was to the following effect. He confined himself strictly to what he knew from personal observation. The first shock he witnessed was on the $\frac{15}{16}$th of December last. He was then at Herculaneum in Louisiana. A few seconds before the motion was felt, he and others heard a considerable roaring or rumbling noise, resembling a blaze of fire acted upon by wind. The first motion of the frame of the house on which he stood was tremulous. It began instantly after to rock pretty violently. This continued, as he thought, from ten to twelve minutes. The vibrations of the chimney were, perhaps, about three or four inches each way, and were in the direction of southeast and northwest nearly. The noise which preceded the shock was from the northwest. Its commencement was about two o'clock in the morning. One hour after there was a second, which was light, and of very short duration. No houses or chimnies were thrown down by either of those. About daylight of the same morning there was a third shock. The motion was very much like the first, but of short duration. This injured several brick and stone chimneys. Its duration between one and a half and two and a half minutes. About sunrise the same morning there was a fourth shock. The vibrations of the chimneys at twenty-five feet from the ground, were at least four inches each way. The direction was the same as the first. The motion of the earth was very perceptible. Cradles rocked, and the church bells rang. Several chimnies were cracked to their bases, and some were broken off as low as the stem or funnel. In this last shock, the water in the river Mississippi was thrown into commotion, bubbling like boiling water; and, in a few minutes, the whole atmosphere was filled with smoke or fog, so that a boat could not be seen within twenty paces from the water's edge; and the houses were so shrouded as not to be seen fifty feet; this smoke continued all the forepart of that day.

In passing along upon his journey, he found the effects had been pretty uniform, and their occurrence and duration nearly the same, as far as Carthage, in the state of Tennessee. There were one or more shocks every twenty-four hours, from the first-mentioned one, until the night of January 1, 1812. Then, at about half after three in the morning, being at Carthage, he felt a severer shock. It threw bricks from a chimney which had been previously broken by the first shock; he found, on inquiry, that the motion was considerably greatest near the large water courses. The court-house at Carthage is a large brick edifice, and was cracked to its foundation, and considerably damaged. Several chimnies had been cast down, by the shock of the 16th of December. Everywhere it was stated to him by those who witnessed the motions, that they were from the south of west, to the opposite point, or vice versa. In the county of Christian, (Kentucky,) a fine and fresh spring of water was observed to run very muddy for several hours. On examining it, after the feculence had settled, he found it to be strongly impregnated with sulphur; so much so that it was spoiled for domestic uses; indeed, it had been converted to one of the strongest brimstone springs he ever met with.

But considerable as these operations were, they were surpassed by others which took place along the river Mississippi; indeed, the strata underlying the bed of this stream appear to have been the principal seat of the commotion, or, at least, the place where it was most considerable. The phenomena were described in the most fearful and alarming strains by several writers. Much exaggeration was interwoven with some of the narratives. Some, indeed, were tinctured with fable and burlesque. Among the various recitals it became exceedingly difficult to find out the true, or even the most probable, account. Five or six witnesses, who seem to have been wholly unknown to each other, agree in so many particulars, that their united evidence may be considered to approach as near to the truth as we can expect to arrive.

First, the writer of a letter from the Chicasah Bluffs, dated December 21st, to his correspondent in Cincinnati, stated many particulars from his personal observation. The first shock happened at thirty minutes after two, on the morning of the 16th, and was followed by many more within a few days. The boat was acted upon by the water in such a manner as to induce a belief that she had grounded; but upon sounding, he could find no bottom. The current, at the place where he was at the time of the occurrence, (eighty-seven miles below the mouth of the Ohio,) acquired three times its former velocity, and the river rose six feet upon its former level; the trunks of trees, bedded in the bottom, suddenly rose in great numbers to the surface; the banks tumbled down at an alarming rate; and the land was rent by cracks and fissures.

Secondly; a writer from New-Madrid, in a communication to a friend in Lexington, dated 16th December, describes a tremendous noise as rousing the family from their sleep, rocking the house, throwing down the chimney, and terrifying them so, that they passed the remainder of the morning, from two o'clock, when the shock was felt, in the open air. During the time of the shock, the heavens were very clear and serene; there being not a breath of air stirring; but in five minutes it became very dark; and a vapour which seemed to impregnate the atmosphere, had a disagreeable smell, and produced a difficulty of breathing. This darkness continued until nearly the break of day. During its continuance there were six more shocks. About half after six it cleared up. However, the danger was increased by another shock, which racked the houses violently, and threw down the chimneys. The darkness returned, and it was accompanied by loud noises, and a bounding motion up and down. Many persons were so alarmed that they formed encampments in the fields. The shocks were repeated from time to time, until the 28th, and then amounted to sixty-seven.

Accounts from Little Prairie stated that ponds had been converted to upland, and dry land to lakes; that the banks of the river had sunk and fallen in to a great extent; that cracks had been formed in the earth; that water had gushed out; and that there was a strange and chaotic mixture of the elements. In some places, sand, mud, water, and stone-coal were reported to have been thrown up thirty yards high.

Thirdly; a more full and circumstantial history of those eruptions and commotions was drawn up by Mr. William Leigh Pierce, who, at the time of their occurrence, was passing down the Mississippi in a boat.

After having described the occurrences of the 16th, 17th, and 18th, up to the 19th, he wrote from the Big Prairie, under date of December 25th, to his acquaintance in New-York, a very circumstantial account, which was published in the journals of the time. His narrative abounds with facts showing the irresistible and ruinous effects of the commotion, which he thinks might be considered as protracted to the surprising length of one hundred and seventy-eight hours.

Fourthly; to these I subjoin another respectable communication, from Mr. Joseph Ficklin of Russelville, (Ken.) who thus describes the earthquakes, in a letter dated February 5, 1812: "The shocks continue. The accounts that you will see in the Nashville and Lexington papers may be confided in. I have conversed with several persons from New-Madrid, all of whom confirm the above. The bottom of the Mississippi river, two hundred miles west of this place, was cracked in some places fifteen feet in width, and cast up *warm* water sufficient to inundate the settlement from one to two feet. In this situation, the poor inhabitants sought for the highest ground, where some remained for seventeen days, looking for the earth to swallow them up. Indians who were two hundred and fifty miles beyond the Mississippi, and about five hundred west of this place, relate sights of horror, in the tumbling down of rocks, the fall of trees, and the lights of fire; which prove to my satisfaction that the cause of this alarm lies in the mountains or hills which are between the head of the Arkansaw river, and the waters of the Missouri, and not more than six hundred miles from this place, a little south of west. The shocks are much more severe one hundred and

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fifty miles west of this than they are here. Fortunately there are no brick or stone houses near the seat of danger to destroy the people. The Indians cannot have suffered much in their tents and bark houses. But the United States will suffer in the sales of their public lands west of the Mississippi for an age. At least the present generation must be buried before the spirit of wandering, in that direction, revives; and may it not be an advantage that some power exists to fix a boundary for our fellow citizens; for my own part, I am pleased in viewing the benefits which my country will derive from this great shock. We had one last night."

Fifthly; there is further information contained in a letter from a gentleman at the mouth of Cumberland river to his friend in Woodford county, Kentucky, dated February 10, 1812; it was published in the newspapers of that state, and corroborates substantially the recitals of the other witnesses.

Sixthly; Daniel Bedinger, Esq. who was passing down the Mississippi, in a boat, at the very time, was a witness of the occurrences, near him; and he described them in his journal, dated at New-Orleans, January 15, 1812: He bears witness of the noises that attended the shocks; the froth that formed on the surface of the river from the bursting of air bubbles; and of the elevation of innumerable logs and trees from the bottom of the Mississippi. Cracks and rents in the earth and the falling of banks were frequent and terrible.

The earthquakes were not felt quite so strongly at or below New-Orleans.

In all these shakings of the ground it is particularly to be observed, that there were but slight indications of them at Baltimore, or in any place to the eastward or northward. The evidence from Philadelphia and New-York was of a dubious character; though some persons at the latter place, and at Newark, assured me they felt several small concus-

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sions. It seemed, however, as if the Maryland side of the Potomac, and the ridge of the Alleghany, might almost be deemed the limits of their extension; the more considerable proofs of their power having been to the westward of the latter, and to the southward of the former, of those boundaries.

On the 23d of January, the earthquakes were renewed, to greater extent than before, and in some places with increased violence.

One was felt at Washington, about nine A. M., and the witnesses of the concussion were very numerous. The phenomena very much resembled that of the 16th of December. A few recitals will answer all the purposes of information.

At Nottingham, in Maryland, the shock was alleged to have happened twenty minutes after nine, and to have lasted a minute. The writer of the account was sitting in a room with two other persons, occupied in reading, when it was asked by one of them what made the chamber shake so? This called the attention of them all to the movement, which they described as having the same effects as the rolling of a vessel on an agitated sea.

The inhabitants of Richmond (Va.) felt it severely at half after nine. Like the former, it was more sensible on Shockoe and Richmond hills, than in the lower parts of the city. In some instances, books were nearly thrown from their shelves, and many persons at breakfast precipitately left the tables.

At Cashockton, in the state of Ohio, on the morning of the 23d of January, at Georgetown, Louisville, Chilicothe, Paris, Washington, and Frankfort, the shocks excited a great share of attention.

At Charleston, (S. C.) on the same morning, to wit, of the 23d of January, at fifteen minutes after nine o'clock, the vibratory shock of an earthquake was felt more severely than on the former occasions.

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This was said to have been more extensive than the preceding ones, inasmuch as the newspapers stated that it was felt at New-York.

Another was experienced in Kentucky, on the 30th of January. It was described in a letter from Louisville to Stephen Ormsby, Esq. as having proceeded from the west, about the same time of night with that of December 29. It was not near so violent. The relater was waked from sleep by a noise like that of a carriage, which was followed by a shake. About six minutes before the shock, the whole heavens appeared to be illuminated, and darkness immediately afterwards ensued. No damage was done.

These commotions were renewed in February, as appears by the intelligence from Michigan, written to me by Judge Witherall:

"The earthquakes continue to visit us. On the 3d instant, fourteen minutes past 4 P. M., a small shock was felt; the mercury low, but not quite in the ball; it had risen very considerably a few hours previous to the shock. On the 7th, at 4 P. M., the weather continuing moderate, the shock was strong, nearly equalling the one I previously mentioned to you, and continued about ninety seconds; on the same evening, at half past seven, another small shock; at fifty-five minutes past nine, the same evening, another small shock; at eleven, another, and at 2 A. M. of the 8th, one which seemed to produce a different motion; that is, like pounding up and down, instead of oscillating."

On the 7th of February several shocks occurred at Pittsburgh. These were most extensively felt, and by no means confined to that region. They began about four in the morning. Many persons were so much alarmed as to rise from their beds and run out of doors, screaming with affright. Flashes of light similar to those seen on the 16th of December were perceived toward the southwest. The last concussions were greater than any that had been experienced before. There was another shake between ten and eleven that night.

Being on horseback in Livingston county, Kentucky, Mr. Riddick, on the morning of the 8th of February, was sensible of the earthquake. His horse refused to proceed, and bracing himself on his legs, stood still. The atmosphere was remarkably luminous for some time prior to the shaking of the ground. There was no moonshine; and yet objects could be seen to a considerable distance. On this occasion the brightness was general, and did not proceed from any point or spot in the heavens. It was broad and expanded, reaching from the zenith, on every side, toward the horizon. It exhibited no flashes, nor coruscations; but, as long as it lasted, was a diffused illumination of the atmosphere on all sides; but no noise was distinguished until the shaking of the earth began; then the usual rumbling sound was heard.

William W. Worseley, Esq. of Lexington, (Ken.) on the 29th of February, reported the particulars at large, and published them in the newspapers.

Thomas Crawford, jun. of Louisville, (Ken.) published an account of the terrestrial commotions in very emphatical terms at Russelville, (Kentucky.)

Mr. Mathias M. Speed wrote to his friend, Thomas Speed, Esq. of Bardstown, an account of the earthquake of February 7, and the following days, in a communication dated March 3, 1812. He states the appearance of frequent lights during the commotions, and that from one of the low islands in the Mississippi, where he was, sand, coal, and warm water were ejected from holes in the earth.

Some of the coal was collected by Mr. Pierce, and transmitted to me. About the 1st of May, 1812, I made a few experiments upon it at the city of Washington. I found it to be very inflammable; it consumed with a bright and vivid blaze. A copious smoke was emitted from it, whose smell was not at all sulphureous, but bituminous in a high degree. Taken out of the fire in its ignited and burning state,

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it did not immediately become extinct; but continued to burn until it was consumed. While blowed upon, instead of being deadened, it became brighter by the blast. The ashes formed during the combustion were of a whitish colour; and when put into water, imparted to it the quality of turning to a green the blue corolla of a phlox whose juice was subjected to its action. By this, and other tests, the alkalinity of the residue was fully ascertained.

The Hon. Israel Pickens of Buncombe county, (N. C.) received a letter from the Rev. John Carrigan, dated 28th of February, and containing the following information:

"During my travels lately to and from the state of Georgia, I made it a part of my business to obtain the most accurate accounts of the present shaking of the earth, from all parts. I have found that in all parts of the continent the motion of the earth has been the same, and its partiality remarked in the same neighbourhoods. In this country, the first rocking (as it is generally called) was perceived on the 23d of December, a little before daylight. Since that time it has been observed almost every week through South Carolina and parts of Georgia. Several persons in those states have told me that they had felt it almost every day since. No damages have arisen, more than a few bricks shaken off some chimneys. There is no truth in the report in circulation respecting the fall of the Painted Rock, and other extraordinaries in Buncombe county. I gave my friend, Colonel Freeman, (in Georgia,) a call, who informed me that he had particularly noticed some tall poplars in his lane during the time of the second shock, rocking with an equable motion from northeast to southwest, which I have found to be general. On the 7th and 16th instant the shaking has been general here. I do not consider it an earthquake proceeding from the usual causes.

"Captain Robert Alexander, of Lincoln, (N. C.) gave me a most alarming account of a phenomenon which was generally seen on the night of the 20th instant. Three large extraordinary fires, in the air, one appeared in an easterly direction, one in the north, and one in the south. Their continuance was several hours; their size as large as a house on fire; the motion of the blaze was quite visible, but no sparks appeared.

"Another phenomenon appeared on the 22d of November, of which I was a spectator. About 2 o'clock P. M. a meteor took fire in the air, attended with a fulminating noise, and bore a southeast direction; and however unaccountable, it is a fact, that about the same instant, a whitish substance, resembling a duck in size and shape, detached itself, and descended with a swift motion, from the cloud of smoke that was formed, and was beheld at my house, and fifteen miles due north of it, and twenty-three miles west of it, at the same instant.

"Whether these things are ominous or not, one thing is certain, this is a time of extraordinaries."

To these curious notices, I add the communication from New-Orleans, of William Shaler, Esq. dated March 23d, 1812.

"DEAR SIR,

"KNOWING the interest you take in all natural events, I do myself the pleasure to communicate to you the following simple account of the late earthquake, as I received it from the patron of a Kentucky boat lately arrived here. On the 7th of last February, at 3 A. M., being moored to the bank of the Mississippi, about thirteen miles above New-Madrid, he was awakened by a tremendous roaring noise, felt his vessel violently shaken, and observed the trees over the bank falling in every direction, and agitated like reeds on a windy day, and many sparks of fire emitted from the earth. He immediately cut his cable and put off into the middle of the river, where he soon found the current changed, and the boat hurried up, for about the space of a minute, with the velocity of the swiftest horse; he was obliged to hold his hand to his head to keep his hat on. On the current's running its natural course, which it did gradually, he continued to proceed down the river, and at about daylight he came to a most terrific fall, which, he thinks, was at least six feet perpendicular, extending across the river, and about half a mile wide. The whirls and ripplings of this rapid were such that his vessel was altogether unmanageable, and destruction seemed inevitable; some of the former he thinks were, at least, thirty feet deep, and seemed to be formed by the water's being violently sucked into some chasm in the river's bottom. He and his men were constantly employed in pumping and bailing, by which, and the aid of Providence, he says, he got safe through! As soon as he was able to look round, he observed whole forests on each bank fall prostrate, to use his own comparison, like soldiers grounding their arms at the word of command. On his arrival at New-Madrid he found that place a complete wreck, sunk about twelve feet below its level, and entirely deserted; its inhabitants, with those of the adjacent country, who had fled there for refuge, were encamped in its neighbourhood: he represents their cries as truly distressing. A large barge loaded with five hundred barrels of flour, and other articles, was split from end to end, and turned upside down at the bank. Of nearly thirty loaded boats only this and one more escaped destruction; the water ran twelve feet perpendicular, and threw many of them a great many rods on shore; several lives were lost among the boatmen. Another fall was formed about eight miles below the town, similar to the one above, the roaring of which he could distinctly hear at New-Madrid. He waited five days for the fall to wear away; during that time the earth was constantly trembling, at intervals of about five minutes. He observed many fissures in the earth below the town, five or six feet wide, extending in length out of sight, and one side several feet lower than the other. On the fifth day he passed the lower fall which had worn away to a practicable rapid. He felt a succession of shocks of earthquake until he came down to Flam Island. He spoke of many physical changes in the river, particularly a great multiplication of sawyers, but he does not describe them with sufficient accuracy to enable me to give you an account of them.

"I have also seen several persons who passed New-Madrid on the 20th of February; they report that the earth still continued to tremble there, at that time. The falls had worn away to smooth rapids.

"With very great respect and esteem I am, Dear Sir, your very humble servant,

"The Hon. Samuel L. Mitchill. W. SHALER."

The information contained in a description, forwarded to William Duane, Esq. by one of his correspondents at St. Genevieve, in Louisiana, shows the state of opinion in the mind of the sensible writer, there, about the 1st of April, 1812, on the subject of the earthquakes at New-Madrid, and the surrounding region. This may be found on the pages of his Aurora.

A. B. Woodward, Esq. one of the judges of Michigan Territory, in his letter of the 7th of April, 1812, wrote thus: "We have had nine shocks of the earthquake here, of which I have an exact memorandum of eight, and have somehow entirely lost the time of the other. I felt four myself. I know only one person, a French lady, who felt the whole; speaking here of the eight." And in a letter dated June 23d, the same gentleman observes, that "in a late journey to the *Riviere aux Tranches*, in Upper Canada, I found the number of shocks of the earthquake felt there, was exactly the same as here, that is, *nine*."

Dr. Robertson, the enterprising traveller to the sources of the Arkansaw River, by order of the government, in 1806, witnessed the phenomena of these earthquakes, very particularly at St. Genevieve, where he resided during their occurrence. He travelled with me from Washington to Fredericktown, on the 3d of July, 1812, and parted with me at that place on the morning of the 4th, he journeying to the westward by the way of Hagerstown, and I proceeding southwestwardly to Harper's Ferry, and its vicinity. This gentleman, among other matters, declared to me, that he had kept a record or memorandum of the shocks of these earthquakes, until they exceeded *five hundred*, and then ceased to note them any more, because he became weary of the task.

The commotions, however, did not end here. They were renewed from time to time. My correspondent, Peter H. Cole, wrote me, in a letter dated at Clarksville, in Montgomery county, Tennessee, under date of December 15, 1812, as follows: "The earthquakes continue to visit us. We had a tolerably severe one on the morning of the 14th instant. The 16th instant will make one year since they commenced. They have destroyed a number of chimneys in this state, and terrified many of the inhabitants."

So, on the 24th of November, 1812, a shock was again felt in the morning, near Russelville, in Kentucky.

The same gentleman afterwards, in a communication from the same place, of January 26, 1813, furnished additional facts. "In the month of September," he stated, "I visited a spring of about the distance of fourteen miles from my residence. It was situated on the bank of a creek that issued forth strong sulphureous water. The smell was evident to a considerable distance. It received its sulphureous impregnation from a very heavy earthquake that occurred in January. Before that event it was a limestone water. On that occasion a new limestone spring broke out about twenty feet above the original spring; and to this day, the respective fountains pour forth their calcarious and sulphureous waters, in distinct currents. Some springs ceased to run for some time; and others ran muddy several hours after the earth had been convulsed. The earthquakes appeared to affect very sensibly both the body and mind of human beings. In some instances, where individuals had been deprived of their usual sleep, through fear of being ingulfed in the earth, their stomachs were troubled with nausea, and sometimes even with vomiting. Others complained of debility, tremor, and pain in the knees and legs. The shocks seemed to produce effects resembling those of electricity. We have had a very wet spring, summer, and autumn, with a loaded atmosphere; and I have no doubt much impregnated with sulphureous particles. Sickness was much more prevalent last winter, spring, summer, and fall, than ever was known in this country; and, no doubt, the state of the atmosphere was the principal cause."

Nor had those subterranean tumults ceased at the close of 1813. For two shocks were felt at Russelville, on the 5th of December, one at ten o'clock in the morning, and the other four in the afternoon.

They were repeated in the Illinois Territory about the same time. Stanley Griswold, Esq. gave an account of them in a short narrative of December 18th. This was printed in the gazettes of the time. They were particularly severe at the salt works belonging to the United States; and but moderate at a short distance off. In the 16th volume of the Medical Repository, p. 304, there are other sensible observations of the same ingenious gentleman.

And on the 29th of December Mr. Hempstead, the delegate in congress from the Missouri Territory, moved for the consideration of a proposition relative to an additional judge in that quarter. He said he had been instructed by the legislature of the territory to bring the measure forward. The settlement of Arkansas, for which the new judge was asked, was situated two hundred miles from New-Madrid, where the courts were then held, and since the late earthquakes, the road had become so nearly impassable, that a circuit of three hundred miles was

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required to go from one place to the other. So great a distance from the seat of justice, obviously amounted, in many cases, to a denial of the benefits of the judiciary, and called loudly upon the legislature for a remedy.

After this minute, reïterated, and, perhaps, tedious detail of facts, it will be rational to attempt some deductions. When I engaged in the task of collecting the evidence on these curious and interesting phenomena, I was in expectation that physical occurrences so immediately before our eyes and under our feet, would have qualified me to form something like a tolerable theory of earthquakes. I must own, however, that after all the information I have collected, I have not been enabled to offer a solution, by any means satisfactory to myself. But, although materials may yet be wanting for a perfect theory, it is a matter of some consolation to have assembled into one body, the phenomena of the most memorable earthquakes that ever agitated these parts of North America, and to have made a record of them for my more sagacious and fortunate successors.

1. The trembling of the earth was felt from the Atlantic Ocean to the regions far beyond the Mississippi. The accounts given by the Indians uniformly stated that the shocks had been very frequent and violent, to a great distance up the Arkansaw. They appear to have been very little felt to the north of the Potomac, and east of the Alleghany.

2. Though the commotions were of great extent, it was not possible to assign a priority to any place. Though the earthquakes were not equally violent or extensive, yet in those of the widest diffusion or circuit, there was no method of tracing a succession; on the contrary, the shocks in the most distant situations were synchronous, or nearly so.

3. Air was produced below, and extricated into the atmosphere.

4. This, when it passed through water, produced bubbles and froth, and after their extrication, formed visible vapour, obscuring the atmosphere.

5. Hot water was ejected with considerable force.

6. Coal or carbonated wood was thrown up in a similar manner, and about the same time.

7. Light, in some instances, was extricated, and from the circumstances of its appearance, may be considered, not as an accidental coincidence of the earthquake, but as a natural and necessary accompaniment. But, in most places, there was no luminous appearance.

8. Sounds were sometimes heard, but by no means uniformly or steadily. In very many cases there was no noise at all.

9. The gas, (§ 3. and 4.) the hot water, (§ 5.) and the coal, (§ 6.) lead conclusively to the existence of subterranean fire; and the light (§ 7.) and sound (§ 8.) induce the same belief.

10. But, after all, it is not very evident what kindles the flame beneath; by what means it is supported by air, and kept from extinction by water; how deep it lies; how it convulses the superincumbent strata, and communicates its tremors instantaneously, for several hundred miles. Nor am I able to explain to my satisfaction, why a certain part of the bed of the Mississippi was its focus; nor why it happened during the winter season.

I console myself, however, that the history which I have written will give valuable information to the curious on these subjects, and assist some more happy inquirer into nature, to deduce a full and adequate theory of earthquakes.

Let me, nevertheless, before I lay down my pen, request the reader to consider this paper as a sequel to the history of the earthquakes in New-England, as has it been written by the learned and ingenious Samuel Williams, LL. D. and published in the transactions of the American Academy of Arts and Sciences at Boston.

Permit me also to observe, that cotemporaneous earthquakes have agitated other regions of the globe. Terrible commotions were experienced among the Azores in 1808 and 1811; and in Venezuela and St. Vincents in 1812. I have collected the facts into distinct histories, which I intend at convenient times to offer to this society.

The favourers of the several hypotheses invented to explain the awful phenomena of earthquakes, may all find arguments to support them, in the preceding recitals. The *mechanical* reasoner will find the great strata of the earth falling in some places, rising in others, and agitated everywhere. The *chemical* expositor will discover evidence enough of subterranean fire in the coal, hot water, vapour, and air bubbles which were ejected and extricated. The *electrical* philosopher will deduce from the lights, the noises, and the velocity of their motions, conclusions favourable to the origin of earthquakes from electron, that subtile and universal agent. Even the believer of the conversion of metallic potassium, by rapid inflammation, into common potash in the deep recesses of the earth, will find in the salt-petrous sandstone of the western states, a better argument than any I am acquainted with, to countenance the *alkaline* system of earthquakes. And yet, these various expositions, plausible, in some respects, as each of them is, are deficient in that general character and universal application which ought to pervade scientific researches.

The Leading Facts relative to the Earthquakes which desolated Venezuela, in South America, in the months of March and April, 1812.

During the time that North America was shaken by earthquakes of greater violence than had been experienced before, the regions of the southern section of the western hemisphere, were the seat of more terrible disorders from the same cause.

Mr. Drouet has written the most scientific history of them that I have seen. He had visited Venezuela in a military capacity, and was there when the earthquakes occurred. On his return to Guadaloupe, he published in French a description of the tremendous events that had happened where he had been. From that the materials forming the body of this essay have been extracted.

This ingenious gentleman states, that the mountains surrounding the city of Caraccas, and those forming the chain lying between it and the port of Laguira, have the appearance of extinguished volcanoes. Parcels of lava are found in abundance, as are likewise confused masses of quartz, broken granites, portions of metals which had undergone fusion, with iron and copper almost carbonized; whence, he thinks, it may be concluded that the country had long before experienced the operation of volcanic eruptions.

At the base of these mountains there is no natural disposition of the earth in horizontal layers; but the soil and stones are irregularly jumbled together. The mountain called Sylla contains more volcanic productions than any in the neighbourhood of Caraccas, and its summit is nine hundred toises (five thousand four hundred French feet) above the level of the ocean. The city and plain of Caraccas are only five hundred and

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sixty toises (three thousand three hundred and sixty feet) high. This elevation renders the region one of the most excellent and agreeable upon the globe, although its latitude is no more than eleven degrees thirty minutes north.

The base of Mount Sylla is calcareous, approaching, in many places, to the character of lime or chalk; and of a micaceous substance intermixed with primitive rocks, and interspersed with metallic veins containing bismuth, plumbago, antimony, iron, and even small quantities of copper and silver. Plants and shrubs scarcely grow upon it; and the bare and parched sides of this and the other mountains which form the borders of the valley of Caraccas, make a most striking contrast with the fertility and luxuriance below. And what is very remarkable, in this mountainous region the earth abounds with saltpetre; insomuch that Mr. Ponsard, after having satisfied himself of the fact, was occupied in establishing a manufacture of the article, when the earthquake laid his works in ruins.

These subterranean commotions are supposed not to have been the first which Venezuela has experienced. From the testimonials extant, there is reason enough to conclude, that the country has undergone violent convulsions in times more remote than the date of history.

During passion week, on holy Thursday, at 4 o'clock in the afternoon of the 26th day of March, 1812, while the streets of Caraccas were filled with processions, and the churches with priests and people, and while the ceremonies of flagellation and bearing the cross were performing, a most destructive earthquake occurred. The cracking of houses, and the descent of tiles, as if acted upon by a gust of wind, were the first notices of it. As the atmosphere was calm, and not a breath of air was stirring, the cause was instantly conjectured.

The shocks succeeded each other with incredible rapidity; and were so strong that persons standing and walking tottered, and were even thrown to the ground.

Private houses, public buildings, and churches, tumbled down in all directions. Clouds of dust enveloped every thing; and the crash of edifices, with their dead and wounded inhabitants, exhibited terrible spectacles on every side.

The wretched survivors wandered about all night; and the next day were ordered by the magistrates to retire from the ruins of the city, and encamp on the adjoining plain.

The shocks continued almost without interruption during the 27th; and were regularly preceded by a rumbling and distant noise that added to the horror of the scene. They were repeated at intervals until the 4th of April, when, at four in the afternoon, there was another as violent as that of the 26th of March, and of much longer duration. This completed the destruction of those things which had escaped the former. Of forty churches, only three escaped demolition, and even these were very much damaged. Many other cities were deeply injured; particularly Porto Cavallo, San Philip, and Laguira, in the latter of which only three houses were left standing, the rest having been overturned on the heads of their occupants.

Some of the commotions were partial or local. Certain of them, for instance, which were felt at Caraccas, were not perceived at Laguira; and *vice versa.* The sound preceding and accompanying them was more sensible in high situations. This was aptly compared to the roaring of thunder under ground; and it was ascertained that there were noises without shocks; though this might arise from the extension of the sound to a greater distance than that of the shock.

As far as could be discovered, the rumours and tremors proceeded from west to east. During the commotions, the atmosphere was observed to have suffered various changes. As there was an almost unin-

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terrupted calm, the heat was considerably increased. Lightning and meteors were multiplied to an alarming degree; although the horizon was not loaded with clouds, nor were there any tokens of an approaching storm.

Mr. Drouet thinks it worthy of investigation, how far the Venezuela earthquakes may have had a connexion with the Cordilleras, with the workings of volcanoes, and particularly with the furious eruption at St. Vincent, an island belonging to the chain of the Antilles, about the beginning of May, 1812. On the theory of earthquakes, this gentleman, after examining the several hypotheses of those who ascribe them to fire acting upon subterranean fuel and forming very elastic vapour; to fire acting upon water and converting it to most powerful steam; to fire producing both rarified air and rarified water; and, lastly, to the subtile, pervading, and irresistible force of electricity; leaves the subject, in that respect, like his predecessors, exactly where he found it.

To this abstract of Mr. Drouet's pamphlet, I shall annex a few of the statements made by residents in Venezuela, to their friends in the United States.

The first is contained in a letter from a merchant in Laguira to his friend in New-York, dated April 1, 1812:

"On the 26th. ult. at 4 P. M. we had an earthquake here, which has completely ruined this part of the province. Not a house is standing that any person would venture to remain in a single hour, and nine tenths of the town are level with the ground. From two thousand five hundred to three thousand persons, it is calculated, have lost their lives. Caraccas has shared the same fate. I was there at the time the dreadful catastrophe happened, and escaped by running from the house into a large court yard in which nothing could fall upon me, where I remained until it was over. We had one or more shocks every day since.

"There is not a house in Laguira, nor more than fifty in the whole city of Caraccas, but will have to be pulled down, or the places completely abandoned, which latter, I think, will be the case, and cities and towns built on places adjacent, and of wood. Ten thousand lives are said to be lost in Caraccas, but it is impossible to tell to a certainty. They have been digging out the bodies ever since, and burning them. It is shocking to see, at the close of the day, heads, arms, and legs, that have been left unburnt, as the fire dies away: and the stench is terrible. Every person is ordered out of Caraccas, except labourers, to avoid a pestilence. Three fourths of the wealth of Caraccas are lost; and, as no day has yet passed without a shock, we are waiting with fear and trembling to know when it will be entirely over, or what the effects of the next shock will be. All foreigners, and every person having the means, are leaving the place for the islands and elsewhere."

The next was written by a spectator of the ruins of Laguira, to his correspondent in Philadelphia, and bears the date of the 2d day of April, 1812. The melancholy narration it contains renders it worthy of preservation.

"Many times in my life have I experienced the goodness of a Merciful God toward me, but never so conspicuously as in my preservation during the tremendous exertion of his power, which has shaken the mountains to their foundation, and levelled the greatest part of this city, as also that of Caraccas, with the ground. Thousands and tens of thousands have been buried, and most of them now lie beneath the ruins! The stench arising from the dead bodies is intolerable; such of them as could be come at have been thrown into the sea, or collected into heaps and burnt to ashes. It is imagined that seven eighths of the houses in this city are demolished, and of those which still stand, there are not, perhaps, twenty that will be found tenantable. The custom-house, which was built very strong, is not much injured. The house

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which I occupy is three stories high, and was likewise very strong; it stood the shock without falling, but it was so much injured that I do not intend to sleep in it, especially as we are constantly kept in a state of alarm by the frequent shocks that have daily taken place ever since the 26th ultimo. When the first great shock occurred, I ran out of my house, and in my amazement I turned round and beheld it rocking like a cradle, which, with the roaring of the earthquake, the screams of people, and the crashing, perhaps, of a thousand buildings, made the scene horrible beyond description."

A third account is derived from the communication of another inhabitant and witness, at the same time and place with the preceding:

"On Thursday, at 4 P. M. (the 26th of March,) a severe shock of an earthquake was felt here. It came from the east. On its first approach, it appeared as though there was a discharge in the neighbourhood of some thousands of cannon; a moment after the earth began to raise about eighteen inches, and ran in waves for about two seconds, of at least that height; it continued altogether for about one and a half minutes, during which time it prostrated more than two thirds of the houses, and rendered the others untenantable; killed, at least, one half of the inhabitants, and wounded very many. Neither the strongest fancy, nor the brightest imagination, can come any way near to portraying the dismal aspect of the scene. Words to describe it are not in use; you can form no idea of it. On every side was to be heard, my wife! my husband! my children! my sisters! my brothers! where are they! where are they! They are dead! Oh they have perished! These words were uttered in the strongest tone of anguish and despair.

"It was one of the holydays; a day rendered remarkable in christian annals, by being the anniversary of that day on which our Saviour was nailed to the cross—an hour only before a representation of that ceremony was to have been carried through the streets. Every church was full, and every one was shaken to the earth. To the amount of nine hundred or one thousand persons can be counted in two churches, all having perished. Not a house in Caraccas is inhabited. The people have, as well as here, left the place, and raised tents in the open fields.

"I was a witness to the internment of about fifty, who, on their knees, were imploring the protection of the Divinity, and who, at a less distance than twenty steps, were covered by the falling of two houses."

The fourth of these pieces I shall add, is dated April 4th, 1812, at Laguira, and is as follows:

"A very heavy earthquake, which took place here on the 26th ult. has laid this town in total ruins; not a house standing except a few which are so shaken and shattered as to be uninhabitable. The city of Caraccas, fifteen miles distant, is in a still more deplorable condition. There a total fall of all the houses has been effected. In Laguira the custom-house is still standing, but is cracked in many places. The killed in Caraccas are estimated at nine thousand. In Laguira, at one thousand five hundred. My own escape is miraculous, for I was amidst the destruction in Caraccas, whither multitudes of people had gone in consequence of the great holydays, which began on the very day of the earthquake. The houses in the street where I walked did not fall immediately. I ran to the market square, which was close by; there were five of us in company, only three survived. As soon as the earth began to shake, the Spaniards dropt on their knees; had they run like the strangers, many more of them would have escaped."

For the relief of the sufferers by these calamitous occurrences, congress passed an act appropriating fifty thousand dollars for the purchase of flour. This donation was promptly forwarded to Venezuela, in vessels chartered for the purpose; and the transaction is worthy of being remembered as an instance of friendship and generosity in the highest degree honourable to its authors.

It does not appear from any document in my possession to what extent these earthquakes prevailed; nor in what manner they affected the remote and internal provinces.

Description of the Volcano and Earthquake which happened in the Island of St. Vincents, on the 30th day of April, 1812.

The gazette published at Bridgetown, in Barbadoes, for May 6th, 1812, contained the original intelligence of a terrible eruption in the mountain called *Souffriere,* in St. Vincents; and this may serve as an introduction to the present paper.

"Amongst the evils, natural and experimental, which this island did already most wofully experience, it has now to enumerate the awful visitation of an eruption of the Souffriere Mountain; which, in its symptoms and effects, surpasses the most terrific picture we can possibly draw of it. The following, as far as we have yet ascertained, are the particulars.

"On Monday last, a loud explosion of the volcanic mountain took place, followed by an immense column of thick sulphureous smoke, which suddenly burst over the vicinity of the crater, and in the course of a minute discharged vast quantities of volcanic matter. The whole surface became covered with ashes, which presented an alarming appearance; and the noise which proceeded from the bowels of the mountain, threw the whole neighbourhood into the utmost consternation.

But this is not all: the amazing scene remains yet to be told! The eruption, continuing with increased violence, presented on Thursday night, and yesterday morning, one of the most awful sights human imagination can form an idea of. The mountain burst forth in a most tremendous blaze, throwing up huge spouts of fire and burning stones, accompanied with the most frightful thundering noise, at the same time sending down its sides torrents of burning matter, and scattering in the air large pieces of rock, which, in their descent, made a dreadful ravage among the cattle, &c. Some idea may be formed of this awful conflagration, when it is stated, that showers of volcanic particles continued pouring for several hours all over the island, accompanied at intervals with violent shocks of earthquake; and, at times, from the dreadful aperture of the mountain, were shot off rocks of enormous size, which, in their fatal fall, have done the most calamitous injury; and such has been the destructive impetuosity of the liquid fire, that its baneful effects are of the most serious nature. The brilliancy of the flames, which majestically rose from the mouth of the crater, had a most sublime and awful effect, and the burning stones which darted in the air resembled the stars in a rocket. The vivid flashes of lightning which shot forth with a noise far exceeding the heaviest artillery, resembled in colour and brightness what is usually seen in a tempest; and the curling sheets of smoke so obscured the sky, that yesterday morning, until ten o'clock, was nearly involved in nocturnal darkness. So dreadful were these appearances, that our terrors added new horrors to the scene; the whole island was in a state of trepidation, and the people, filled with supplication and dread, precipitately retreated from their homes to places of shelter.

"About noon yesterday, the wind blew from the southeast, the sun made its appearance, and the whole heavens began to brighten. The eruption, we find, has abated considerably in its violence; but we under-

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stand that the leeward and windward plantations are covered all over with torrents of melted matter.

"We have not been able, as yet, to ascertain correctly the extent of damage done, or the number of lives lost; but the principal rivers of the island (those particularly within the influence of the volcano) are all dried up. The Negro provision grounds, for miles around, are completely destroyed, and the pastures, on the windward and leeward side of the island, are so covered over with ashes and vitrified pieces of stone, that there is not left a bit of ground, in appearance, for the cattle to feed upon. Every means should instantly be resorted to, to prevent the calamities likely to ensue from so distressing a catastrophe; and we trust, the legislature will immediately adopt such measures as will ensure the importation of dry provisions, sufficient for the call of the inhabitants.

"Accounts from the post at Owin have just reached town; they report that that part of the island presents nothing but objects of desolation. The stupendous block-house there having fallen to the ground, and the range of the mountain on the windward side split open—from which issued torrents of lava, consuming, in its course, every tree and shrub that impeded its way; and the surface of the hills and valleys, in that quarter, covered all over, several inches thick, with a sort of volcanic matter, resembling the dross that is thrown from a smith's forge. The noise from the mountain has been so violently felt there, that to give an idea of it, one may imagine a mixed sound made up of the raging of a tempest—the murmur of a troubled sea—and the roaring of thunder and artillery, confused altogether."

Afterward a more full and comprehensive account was drawn up by some gentleman whose name I regret that I have not been able to ascertain; and the more so, as he unquestionably possesses good powers for observation as well as delineation.

"The Souffriere Mountain, the most northerly of the lofty chain running through the centre of this island, and the highest of the whole, as computed by the most accurate survey that has yet been taken, had for some time past indicated much disquietude; and from the extraordinary frequency and violence of earthquakes which occurred within the last year, portended some great movement or eruption. The apprehension, however, was not so immediate as to restrain curiosity, or to prevent repeated visits to the crater, which of late had been more numerous than at any former period, even up to Sunday the 26th of April; when several gentlemen ascended it, and remained there some time. Nothing unusual was then remarked, or any external difference observed, except rather a stronger emission of smoke from the interstices of the conical hill, at the bottom of the crater. To those who have not visited this romantic and wonderful spot, a slight description of it, as it lately stood, is previously necessary and indispensable to form any conception of it, and to the better understanding the account which follows; for no one living can expect to see it again in the perfection and beauty in which it was on Sunday, the 26th of April.

"About two thousand feet from the level of the sea, (calculating from conjecture,) on the south side of the mountain, and rather more than two thirds of its height, opens a circular chasm, somewhat exceeding half a mile in diameter, and between four and five hundred feet in depth; exactly in the centre of this capacious bowl, rose a conical hill, about two hundred and sixty or three hundred feet in height, and about two hundred in diameter, richly covered and variegated with shrubs, brushwood, and vines, above half way up, and for the remainder, powdered over with virgin sulphur to the top. From the fissures in the cone and interstices of the rocks, a thin white smoke was constantly emitted, occasionally tinged with a slight bluish flame. The precipitous sides of this magnificent amphitheatre were fringed with various ever-

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greens and aromatic shrubs, flowers, and many Alpine plants. On the north and south sides of the base of the cone were two pieces of water, one perfectly pure and tasteless, the other strongly impregnated with sulphur and alum. This lonely and beautiful spot was rendered more enchanting by the singularly melodious notes of a bird, an inhabitant of these upper solitudes, and altogether unknown to the other parts of the island; hence, principally, called, or supposed to be, invisible; though it certainly has been seen, and is a species of the merle.

"A century had now elapsed since the last convulsion of the mountain, or since any other elements had disturbed the serenity of this wilderness, than those which are common to the tropical tempest. It apparently slumbered in primeval solitude and tranquillity, and from the luxuriant vegetation and growth of the forest which covered its sides from the base nearly to the summit, seemed to discountenance the fact, and falsify the records, of the ancient volcano. Such was the majestic, peaceful Souffriere, on the 27th of April; but we trod on 'ignem repositum cineri doloso,' and our imaginary safety was soon to be confounded by the sudden danger of devastation. Just as the plantation bells rang twelve at noon on Monday the 27th, an abrupt and dreadful crash from the mountain, with a severe concussion of the earth, and tremulous noise in the air, alarmed all around it. The resurrection of this fiery furnace was proclaimed in a moment by a vast column of thick, black, ropy smoke, like that of an immense glass-house, bursting forth at once, and mounting to the sky, showering down sand, with gritty calcined particles of earth and favilla mixed, on all below. This, driven before the wind toward Wallibon and Morne Ronde, darkened the air like a cataract of rain, and covered the bridges, woods, and cane-pieces, with light gray-coloured ashes, resembling snow when slightly covered by dust. As the eruption increased, this continual shower expanded, destroying every appearance of vegetation. At night a very considerable degree of ignition was observed on the lips of the crater; but it is not asserted, that there was as yet any visible ascension of flame. The same awful scene presented itself on Tuesday; the fall of favilla and calcined pebbles still increasing, and the compact pitchy column from the crater rising perpendicularly to an immense height, with a noise at intervals like the muttering of distant thunder. On Wednesday the 29th, all these menacing symptoms of horror and combustion still gathered more thick and terrific for miles around the dismal and half-obscured mountain. The prodigious column shot up with quicker motion, dilating as it rose like a balloon. The sun appeared in total eclipse, and shed a meridian twilight over us, that aggravated the awful gloom of the scene, now completely powdered over with falling particles. It was evident that the crisis was as yet to come; that the burning fluid was struggling for a vent, and labouring to throw off the superincumbent strata and obstructions which suppressed the ignivomous torrent. At night it was manifest that it had greatly disengaged itself from its burden, by the appearance of fire, flashing now and then, flaking above the mouth of the crater.

"On Thursday, the memorable 30th of April, the reflexion of the rising sun on this majestic body of curling vapour was sublime beyond imagination; any comparison of the Glaciers, of the Andes, or Cordilleras with it, can but feebly convey an idea of the fleecy whiteness and brilliancy of this awful column of intermingled and wreathed smoke and clouds; it afterwards assumed a more sulphureous cast, like what we call thunder clouds, and in the course of the day, a ferruginous and sanguine appearance, with much livelier action in the ascent, a more extensive dilatation, as if almost freed from every obstruction; in the afternoon, the noise was incessant, and resembled the approach of thunder still nearer and nearer, with a vibration that affected the feelings and hearing; as yet, there were no convulsive motions, or sensible earthquake. Terror and consternation now seized all beholders. The Charraibs, settled at Morne Ronde, at the foot of the Souffriere, abandoned their houses, with their live stock, and every thing they possessed, and fled precipitately toward town. The negroes became confused, forsook their work, looked up to the mountain, and, as it shook, trembled with the dread of what they could neither understand nor describe; the birds fell to the ground, overpowered with showers of favilla, unable to keep themselves on the wing; the cattle were starving for want of food, as not a blade of grass, or a leaf, was now to be found; the sea was much discoloured, but in no wise uncommonly agitated; and it is remarkable, that throughout the whole of this violent disturbance of the earth, it continued quite passive, and did not at any time sympathize with the agitation of the land. About four o'clock, P. M. the noise became more alarming, and just before sunset, the clouds reflected a bright copper colour, suffused with fire. Scarcely had the day closed, when the flame burst, at length, pyramidically from the crater, through the mass of smoke; the rolling of the thunder became more awful and deafening; electric flashes quickly succeeded, attended with loud claps; and now, indeed, the hurlyburly began. Those only who have witnessed such a sight, can form any idea of the magnificence and variety of the lightning and electric flashes; some, forked zigzag, playing across the perpendicular column of the crater; others, shooting upward from the mouth, like rockets of the most dazzling lustre; others, like shells, with their trailing fuses lying in different parabolas, with the most vivid scintillations from the dark sanguine column, which now seemed inflexible, and immoveable by the wind. Shortly after seven, P. M. the mighty caldron was seen to simmer, and the ebullition of lava to break out on the northwest side. This, immediately after boiling over the orifice, and flowing a short way, was opposed by the acclivity of a higher point of land, over which it was impelled by the immense tide of liquefied fire that drove it on, forming the figure V in grand illumination. Sometimes, when the ebullition slackened, or was insufficient to urge it over the obstructing hill, it recoiled back, like a refluent billow from the rock, and then again rushed forward, impelled by fresh supplies, and scaling every obstacle, carrying rocks and woods together, in its course down the slope of the mountain, until it precipitated itself down some vast ravine, concealed from our sight by the intervening ridges of Morne Ronde. Vast globular bodies of fire were seen projected from the fiery furnace, and bursting, fell back into it, or over it, on the surrounding bushes, which were instantly set in flames. About four hours from the lava boiling over the crater, it reached the sea, as we could observe from the reflection of the fire, and the electric flashes attending it. About half past one, another stream of lava was seen descending to the eastward, toward Rabacca. The thundering noise of the mountain, and the vibration of sound that had been so formidable hitherto, now, mingled in the sullen monotonous roar of the rolling lava, became so terrible that dismay was almost turned into despair. At this time the first earthquake was felt; this was followed by showers of cinders, that fell with the hissing noise of hail during two hours. At three o'clock, a rolling on the roofs of the houses indicated a fall of stones, which soon thickened, and, at length, descended in a rain of intermingled fire, that threatened at once the fate of Pompeii, or Herculaneum. The crackling and coruscations from the crater at this period exceeded all that had yet passed. The eyes were struck with momentary blindness, and the ears stunned with the glomeration of sounds. People sought shelter in cellars, under rocks, or any where; for everywhere was nearly the same; and the miserable negroes flying from their huts, were knocked down, or wounded, and many killed in the open air. Several houses were set on fire. The estates situated in the immediate vicinity seemed doomed to destruction. Had the stones that fell been propor-

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tionally heavy to their size, not a living creature could have escaped without death. These having undergone a thorough fusion, they were devested of their natural gravity, and fell almost as light as pumice, though, in some places, as large as a man's head. The dreadful rain of stones and fire lasted upwards of an hour, and was again succeeded by cinders, from three till six o'clock in the morning. Earthquake followed earthquake almost momentarily; or, rather, the whole of the island was in a state of oscillation; not agitated by shocks, vertical or horizontal, but undulated like water shaken in a bowl.

"The break of day, if such it could be called, was truly terrific. Darkness was only visible at eight o'clock, and the birth of May dawned like the day of judgment; a chaotic gloom enveloped the mountain, and an impenetrable haze hung over the sea, with black sluggish clouds of a sulphureous cast. The island was covered with favilla, cinders, scoria, and broken masses of volcanic matter. It was not until the afternoon, the muttering noise of the mountain sunk gradually into a solemn yet suspicious silence. Such were the particulars of this sublime and tremendous scene, from commencement to catastrophe. To describe the effects is, if possible, a more difficult and truly most distressing task."

History of the Earthquakes and Volcanoes in the Azores, particularly in the Islands of St. George, Pico, and St. Michael, and in the adjoining Ocean, during the years 1808 *and* 1811.

During the month of December, 1808, I examined, at the house of the president of the United States, specimens of coal, lava, and pumice, that had been sent to him by our consul then residing in the western islands. Mr. Dabney had forwarded these volcanic productions from Fayal, with a narrative of some natural occurrences there of a singular and alarming kind. On the 1st day of May, 1808, at one o'clock in the afternoon, as he was walking in the balcony of his house at St. Antonio, he heard noises like the report of heavy cannon at a distance, and concluded there was some sea engagement in the vicinity of the island. But soon after, turning his eyes toward the island of St. George, ten leagues distant, he perceived a dense column of smoke rising to an immense height. It was soon judged that a volcano had burst out near the centre of the island; and this was rendered more evident after night had come on, by an awful exhibition of fire. Being desirous of viewing the phenomenon, he embarked on Tuesday the 3d, with the British consul, and ten other gentlemen, for St. George. They ran over in five hours, and arrived at Vellas, the principal town, at eleven in the morning. They found the inhabitants overcome with dread, and devoted to the performance of their religious ceremonies. They were informed that the fire had broken out in a ditch, amidst fertile pasture, three leagues northeast of Vellas, and had immediately formed a crater in size about twenty-four acres. In two days it had thrown out cinders and pumice stones which a northeast wind had propelled somewhat southerly; and which, independent of the mass accumulated round the crater, had covered the earth from one foot to four feet in depth, half a league in width, and three in length. Then passing the channel five leagues, had done some injury to the eastern point of Pico.

The fire of that large crater had nearly subsided; but in the evening preceding their arrival, another, but a smaller, crater had opened, one league north of the large one, and only two leagues from Vellas.

After taking some refreshment, they visited the second crater, the sulphureous smoke of which, driven southerly, rendered it impracticable to reach the large one. When they came within a mile of the crater, they found the ground rent in every direction; and on their nearer approach some of the chasms were six feet wide. By leaping over the narrow ones, and making circuits to avoid the larger, they at length arrived within two hundred yards of the spot. It was found to be in the middle of a pasture, distinctly visible at intervals when the dense smoke which swept the earth dispersed a little. The mouth of it was only about fifty yards in circumference. The fire seemed to be struggling for vent. The force with which a pale blue flame issued forth resembled a powerful steam engine multiplied a hundred fold. The noise was deafening. The earth, where they stood, had a tremulous motion. The whole island seemed to be convulsed. Horrid blowings were occasionally heard from the bowels of the earth; and after having remained there about ten minutes, they returned to town, and found the inhabitants had mostly quitted their houses, and remained in the open air, or under tents. They passed the night at Vellas; and the next morning went by water to Ursulina, a small seaport town, two leagues south of Vellas. Here they examined that part of the country which was covered with the cinders before mentioned, and which had turned the most valuable vineyards to a frightful desert.

On the same day, May 4th, the party returned to Fayal. But on the 5th, and the succeeding days, from twelve to fifteen volcanic openings were made in the very fields the gentlemen had traversed on the 3d, from the chasms before mentioned. They ejected a quantity of lava, that travelled slowly on toward Vellas.

The fire of these small craters subsided, and the lava ceased to run on the 11th. Immediately the large one, which had lain quiet for nine days, burst out anew with great fury. Its thunders were heard distinctly to the distance of twelve leagues, while it threw up lava, and diffused light over the whole island.

These operations continuing with tremendous force, until the 5th of June, exhibited the awful, yet sublime, spectacle, plainly beheld from Fayal, of a river of fire discharging itself into the sea. On that day, their violence began to abate; and in a few days all was still.

The distance of the crater from the shore is stated to have been about four miles; and its elevation nearly three thousand and five hundred feet. The lava overwhelmed the town of Ursulina, the country houses and cottages adjacent, and all the farm houses, in its course. Timely notice was received of the approaching stream of melted matter, and the greater number of the inhabitants fled. Some few, however, having remained in its neighbourhood too long, in endeavouring to save their furniture and effects, were scalded by puffs of steam, which, without injuring their clothes, destroyed not only their skins, but their flesh. About sixty persons experienced the destructive effect of heat in this way, some of whom died on the spot, and others within a few days. Numbers of cattle perished miserably by similar blasts of highly-heated vapour.

The judge and principal inhabitants left the island very soon after the eruption began. The consternation, for several days, was so great among the people, that their domestic concerns were abandoned; and, in the midst of plenty, they were in danger of starving. But on the subsiding of the commotion, it was really discovered, that the island of

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St. George, heretofore rich in cattle, corn, and wine, had been so extensively damaged, that a spectacle of greater desolation and distress has rarely been witnessed in any part of the world.

In January, 1811, there were other phenomena, of a nature yet more curious, in and near the island of St. Michaels. Mr. Thomas Hickling related, that on the 29th, 30th, and 31st of that month, the people of that place were very much alarmed by frequent shocks of earthquakes, probably twenty or more. On the 1st of February, information was received that a volcano had broken out in the sea, five leagues west of St. Michael's Port, and half a league from the land, in fifty or sixty, and some fishermen say seventy or eighty, fathoms of water. He repaired immediately to that part of the island, and, to his utter astonishment, beheld a vast column of black smoke issuing out of the ocean. There was then a gale from the southward, which blew the smoke over the land. The sea was excessively agitated, and the surf on the shore was frightful. He was assured by the peasants, that the preceding night fire had been emitted. During the ensuing night, several persons whom he directed to keep watch, saw, at different times, fiery appearances like rockets. Large masses, apparently of stone or lava, were thrown above the surface of the water. In eight days, the elements became calm; but a shoal was left, on which the waves rolled in breakers.

Mr. Andrew Adam, of St. Michaels, also bore witness of the earthquakes which shook the island, and of the volcano which rose through the sea. He affirmed, that smoke, fire, cinders, ashes, and stones of prodigious size, proceeded from the watery abyss; and that great numbers of dead fish, having the appearance of being partly cooked, floated about on the surface.

But the commotions in the bottom were renewed about five months afterward. Mr. Thomas C. Burkloe, who was on board a vessel in latitude thirty-eight degrees north, longitude twenty-eight degrees thirteen minutes west, gave a description of it in the following words:

"It commenced on the 15th of June, 1811, and I saw it on the 18th. at which time it looked more terrific than at any time previous, according to information which I got of persons who had observed it from the beginning. It had emitted sand, rocks, &c. sufficient to form an island. The shape of it is very much like a sugar-loaf; the crater was about the centre of this island. I observed many rocks, of near a ton weight, thrown up as much as half a mile above the horizon. There was a constant noise like that of cannonading, and sometimes flashes of fire to be seen, though very seldom, which caused me to think the fire was at a great distance from the vent. The colour of the sea near it was quite changed on account of the motion of the bottom, and the dirt, sulphur, &c. falling into it. A great number of dead fish of different kinds were floating about. We passed under a pillar of smoke, &c. which ascended from the volcano, at about the distance of half a mile to leeward of this new island. During the time we were under it, we experienced a most violent shower of sand, sulphur, hot water, &c.; some of the water tasted salt, some bitter, and some sweet; this variety in the taste of the water was observed by tasting it at different times. The water was so hot that it scalded one of the seamen that had the sleeves of his shirt rolled up. The inhabitants of St. Michaels have felt many severe shocks of earthquake; several of the houses had been thrown down by it, and great numbers of those standing very much damaged. The inhabitants of the west end of the island have lived in open fields ever since the 15th, for safety. Several springs have been discovered lately, near the volcano; the waters of which are so hot that eggs have been boiled in them.

"Five months ago, a similar event took place about four miles southeast of this, and within a mile and a half of the shore, but did not con-

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tinue so long as this has already been burning, nor did it throw up such a quantity of lava."

From one of the gazettes was taken another account, which was stated to have been drawn up by a gentleman just then arrived from St. Michaels.

"In the first part of June last, the inhabitants of the island of St. Michaels were much alarmed and astonished by the appearance of smoke, which apparently issued from the earth, spread over the western part of the island, and continued for the space of two days. This smoke was so strongly impregnated with a sulphureous quality, that the residents of that part of the island were nearly suffocated. At the expiration of the above-mentioned time, an immense eruption was discovered to proceed from the bosom of the ocean, whose depth at that place was fifty fathoms, at about six leagues distance from the principal town or village of St. Michaels, called Posa Delgada, and one mile from the shore. This eruption continued for two days more, emitting nothing but fire and smoke, which appeared to spread as much as three miles round its vicinity, and then disappearing entirely for the space of only a few hours, when it again commenced its volcanic vomitings one league further to the westward, in the same direction from the shore.

"Now was to be seen one of the most awful and magnificent sights that the eye of man ever beheld. Let the reader picture to his glowing imagination a tremendous marine volcano in its most violent operations; casting forth continually immense bodies of sparkling fire, beautifully variegated with colours of the rainbow, intermixed with rising volumes of smoke; at the same time very large rocks are seen ascending to an astonishing perpendicular height, till their force being spent, they return with increasing velocity, to regain, as it were, their former watery station; then let him add the terrific thunderings of the greatest naval battle that was ever fought; and he will have a complete description of this 'awfully sublime' spectacle.

"This last eruption lasted about six days. When it subsided, and the smoke disappeared, a small island was discovered in that place, composed of rocks cemented together by the lava, similar to that which comes from burning mountains. This island is supposed to be about one mile in circumference, and nearly round; having a large basin of water in the centre, apparently half a mile in circumference.

"During the continuance of this monstrous effort of nature, numerous shocks of earthquakes were felt over the whole island. The only damage done, that we know of, was the overthrow of seven small stone houses on the western part of the island, which were entirely demolished. The occupants were obliged to decamp very suddenly, in order to avoid being buried in the ruins of their habitations. A visit to the new island was contemplated to be made immediately. The result of this visit will, no doubt, prove highly interesting to the philosopher, as well as important to the navigator.

"The impatient curiosity of three gentlemen was very near being paid with the loss of their lives. In attempting a visit previous to the termination of the eruption, they were, notwithstanding their greatest efforts, drawn by an overpowering suction of air about half a mile, as they supposed, into the immense body of surrounding smoke. They remained one hour and a half, much frightened by their perilous situation. When, at length, the glorious light of heaven again shone upon them, they were much surprised to find their faces, hands, clothes, and sails, quite blackened, and the deck of their vessel entirely covered more than an inch with a coarse black cinder like those found in a blacksmith's shop. This new island is in latitude thirty-seven degrees, forty-six minutes, longitude twenty-five degrees, fifty-eight minutes."

And it was stated shortly after, that on the discontinuance of the eruptions, Captain Tillard, commanding a British sloop of war on that station, landed upon the new ground, and took possession of it in the name of his sovereign, calling it, after the name of the vessel he navigated, *Sabrina* island. He found it very steep. Its elevation between two hundred and three hundred feet. The chief material, a sulphureous dross of iron. Its circumference was estimated to be between two and three miles, and was judged to be but a crater. The depth of the sea in that place, before the island rose, was two hundred and forty feet.

The narratives of Captain Farwell, Captain Thomas, and Mr. Neill, all of whom were spectators of the eructations of flames and smoke, and the elevation of columns of water, may be seen in the 13th volume of the Medical Repository, p. 98, 99.

The History of that Extensive Commotion of the Atmosphere along the Coast of North America, which commenced off Cape Hatteras, on the 23d of December, 1811, *and progressed to Massachusetts Bay on the 24th, in the form of a northerly snow storm, causing an unusual number of shipwrecks in Long-Island Sound.*

On several former occasions I have availed myself of my situation to delineate the phenomena of the extensive tempests which afflict occasionally the Atlantic coast. I refer to the account I gave of the tremendous storm from the northeast, in February, 1802, (see Medical Repository, vol. 5. p. 465—472.) and of the violent hurricane from the southeast, in September, 1804, (ibid. vol. 8. p. 354—365.) as examples of my attempts in this branch of meteorology. The present tempest was the more impressive at the time, as having almost immediately followed the terrifying earthquakes of the 17th of the same month, which shook the greater part of North America. With an intention to trace the great currents of our atmosphere, and thereby to furnish additional materials for a correct theory of the winds, I now methodize the facts that have come to my knowledge, concerning a dreadful commotion of the air which happened on the 23d and 24th of December, 1811.

At the city of Washington, the weather of Monday the 23d was mild; the sky was clear in the morning. At noon, or a little after, it was overcast, and the wind sprung up at northeast. There was a little rain, which continued until evening, when it ceased. The wind afterward shifted to the northwest, and by ten o'clock at night, blew a furious gale, which continued until morning, and with some abatement, through the whole of the 24th, and the night following.

The day at Leesburgh, up the Potomac, as at Washington, was perfectly clear; but violently windy. The blasts came from the north, and veered occasionally a few points toward the west.

According to correct observations made at Norfolk, the weather, which had been for some days variable, terminated, on Monday the 23d, in a steady rain. On the night of that day, it fell in torrents, until near the break of day, when it was succeeded by a fall of snow and sleet, accompanied by an overwhelming gust of wind from the north and northwest. The air became so intensely cold that the quicksilver fell in the course of the night from fifty to twenty degrees.

Captain Mills, of the brig Eclipse, experienced the gale on the 23d and 24th. He took it in latitude thirty-six degrees north. It came on very suddenly, and blew with such violence, that he could not lay to. He scudded for sixteen hours, under the goosewings of his foresail, and

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was obliged to throw overboard his guns and deck materials. He was on a homeward voyage from Smyrna, and arrived at Baltimore after having beat about, twenty-four days upon the coast.

The ship Marmion, from New-Orleans, came into Chesapeake Bay, on the 23d, before the gale began. But she dragged her anchors, and the crew were obliged to cut away her masts to save her from going ashore.

The schooner Commerce experienced a most severe snow storm in Delaware Bay, on the 23d December; and on the 24th cut both her cables, and went ashore at Nantuxet, covered with ice.

The ship George Dyer, Captain Glavery, arrived at Baltimore from Lisbon, on the 19th of February, having took the gale on the 23d of December, when within twenty leagues of Cape Henry. She was driven off, lost two foreyards, sustained considerable damage in sails and rigging, and lost a man.

I insert the narrative of Captain Jocelin, of the Savannah packet, in his own words. He was bound from New-York to Savannah, and sixteen days after his departure, put into Charleston in distress: "Having on the 23d December met with a most tremendous gale, being about thirty miles to the northward of Cape Hatteras, in about twenty-five fathoms water, the wind the most part of the day being from the eastward, with rain, but a moderate breeze, and carrying single reefed topsails, at 8 P. M., wishing to be under snug sail for the night, we proceeded to double reef the topsails, and while in the act of clewing them down to reef, the wind suddenly chopped round to north northeast, in a most tremendous white squall, which at first ran the brig entirely under water forward. We immediately clewed up the topsails, lowered down the trysail, and haled up the mainsail, and fortunately made out to get the foresail and foretopsail handed, but the mainsail and maintopsail split to pieces, nor was it safe, or any way possible, to send the hands aloft; we totally lost our mainsail and maintopsail, and received much damage in some of our other sails and rigging; we scudded for four or five hours, by which time the sea had risen to a most dreadful height; Captain J. was himself four hours at the helm, and one man with him, till he was so bruised with the tiller that he could stand no longer; the mate and another man then took the helm, and about one o'clock a sea struck her on the larboard quarter, which swept the quarter deck entirely, took the boat from the stern, broached the vessel to, and washed Captain J. overboard, who fortunately saved himself by catching a rope, and got on board again; the quarter-boards and bulwarks were all taken off on the starboard side: we then lay to throughout the gale, which continued with unceasing violence for thirty-six hours, by which time we had drifted as far to the eastward as longitude seventy-two degrees thirty minutes; as soon as the gale abated we put the vessel in as good order as circumstances would permit, and made the best shift we could, having had almost constant head winds ever since, but have at last been so fortunate as to reach Charleston, the wind being still ahead. A few hours before the gale commenced, spoke ship Jefferson from New-York, bound to Wilmington, (N. C.) and on the 27th spoke her again. She had suffered very much in the gale by loss of sails, jib boom, &c. and the captain informed that he came very near losing the ship. About half an hour before the gale, passed a schooner standing to the northward; she must have been taken aback by the squall, and lost, or suffered very much indeed."

The United States brig Nautilus, Captain Sinclair, suffered extremely in this storm. She lay at Norfolk, and had been ordered to go to Newport, (R. I.) I had seen her commander at Washington a few days before he started. She sailed from Norfolk on the 22d of December, and on the 23d, off Delaware Bay, was met by a snow storm. Its violence was dreadful, so as to throw her into the greatest danger. By 12 o'clock at night, as she was lying to, the tempest hove her upon her beam ends, and deluged her with water. She, by good management, righted, and attempted to scud, but the distress of weather was such that it was impossible to get her guns overboard before the evening of the 24th. The wind was so strong, that she was driven between twelve and thirteen knots under a close-reefed maintopsail. At length, fearing to encounter the shoals of Bermuda, she attempted to lay to, and succeeded. By the 26th, the gale had so far moderated, as to enable them to repair sufficiently to steer for the capes of Virginia. After a series of storms and tempests almost without a parallel, (five in number,) from various quarters, and after buffeting waves and billows for twenty-seven days, she arrived at her place of destination almost a wreck, and with a crew nearly exhausted with cold, fatigue, hunger, wet, and almost every maritime misery.

The hour of its commencement at New-York has been stated to be midnight of the 23d, or morning of the 24th. It did considerable damage in the harbour. Among other accidents, the northerly wind drove the ship General Gates, bound for Bordeaux, from her anchorage, upon the shore of Governor's Island, near the castle. Several vessels were sunk beside the wharves. The occurrences of those kinds were too numerous to render a detail necessary.

At Lyme, in Connecticut, six miles and a half west of the city of New-London, the phenomena of the weather were remarked very minutely by Mr. Vine Utley. It will be observed, that New-London is about one hundred and forty-two miles northeastwardly of New-York. On the morning of the 23d of December, the sun rose clear, and the air was pleasant, with a breeze from west southwest. The quicksilver in Fahrenheit's thermometer, at sunrise, was at twenty-four degrees. About noon it began to be cloudy. The mercury rose to forty degrees. It rained a little, and continued warm and rainy until twelve o'clock at night. At that hour the wind shifted suddenly to the north-

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east, and the cold rapidly increased. One of the sentries at Fort Trumbull reported that snow began to fall about two in the morning of the 24th. By the rising of the sun, it had increased to one of the most tremendous snow storms that he recollected for ten years or more. The mercury by this time had fallen to twenty degrees, and by two o'clock in the afternoon was down to eight degrees. The snow continued to fall very fast, the wind increased almost to a tornado, and swept over the plains and Long-Island sound with most dreadful violence. From the time of its beginning it raged for twenty-four hours, with the wind from the north; after which it gradually abated. The snow was so drifted in the roads, that no mail passed either from the eastward or westward in four days. And further to corroborate the time of the storm's commencement, it may be mentioned, that the postmaster at the Riverhead postoffice there was called out of bed at two on the morning of the 24th, and while he was examining the mail, it began to snow, and to grow severely cold.

Perhaps there never was a time when more damage was sustained by shipwreck on the north side of Long-Island. The wind pouring from the north, rendered it a fatal lee shore, from one end to the other of the sound. We are very apt to forget the occurrences of the weather, and the damage done by storms; but a few facts taken from the registers of marine intelligence will enable a judgment to be formed:

"We understand the late snow storm has been uncommonly severe to the eastward, and that the roads between this city and Boston are almost impassable. We further learn that the Boston mail stage, which left this city on Tuesday morning at eight o'clock, only reached Stratford on Thursday night, a distance of about sixty miles.

"The new ship ——, Childs, from East Haddam for New-York, is ashore on Red Spring point, with the loss of her mainmast by the deck, and the mizen topmast and her starboard side all stove in. Captain C.

and one or two of the hands were badly frozen. The whole of the crew swam ashore from the ship, and it was near three quarters of an hour before any dry clothes could be procured for them.

"A schooner from Haddam for New-York, loaded with provisions, is ashore on Oak-Neck Beach, and bilged; all hands saved. There are four sloops ashore at Oyster Bay, and a great number at Cow Bay, Little Neck Bay, and Flushing Bay.

"The sloop Traveller, Captain Conklin, from Sag Harbour for New-York, laden with wood, was driven ashore, in the late storm, at Eaton's Neck; there were fourteen souls on board, and we are sorry to say that thirteen of them perished, including the captain.

"Another sloop was cast away at Eaton's Neck, and several of the crew, it is said, have perished.

"A sloop foundered off Lloyd's Neck, in the late storm; the fate of the crew not known.

"We further learn that a sloop laden with flour was driven ashore at Norwalk, in the late storm.

"At Black Rock, a new sharp-built schooner was driven ashore, and bilged.

"A shallop loaded with hay, from Old Man's Creek, was overset by the violence of the wind on Monday night, and the people, with difficulty, saved their lives.

"The packet Gold Huntress, which left this port, before the storm, for Newport, (R. I.) rode out the gale in New-Haven harbour.

"Mr. Holly's mill-dam, at Stamford, was washed away. Mr. Joseph Crawford's dwelling house, at New-Canaan, was unroofed, without injuring the family. A barn at Stamford was blown down. A free negro man, named Robert, was frozen to death on the road, near Stamford. A negro man at South Salem, aged about eighty, deserted his dwelling

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during the storm in search of a more secure place, and froze to death on the road.

"The fine schooner Maria Louisa, Stowell, bound from this port for Bordeaux, was driven ashore at Gardner's-Island, about twenty miles from New-London, and has bilged. The crew and passengers consisted of twenty-two souls, eighteen of whom were very much frozen, and three were dead, when the last accounts were received from her."

Thirty-six of these bilged, stranded, and wrecked vessels, were counted in one day.

The Boston newspapers noticed this violent storm as having commenced on the morning of Tuesday the 24th, at 4 o'clock. The wind blew from the points between north northeast, and northwest. It continued with extreme severity until the morning of the 25th. Though the wind was so vehement, and the weather intensely cold, there were few disasters on the ocean side; because the ships and vessels had plenty of sea-room. Yet the schooner Greyhound, from Baltimore to Boston, was forced ashore in the Vineyard Sound by the storm, where part of the crew escaped to land, and the rest perished on board.

The transition from warm to cold, was very fatal to animal life. In many instances human beings perished, on land as well as on the water. Domestic fowls suffered extremely. Sheep, in many instances, perished. Neat cattle also were overcome by the intensity of the cold, in many instances. Guinea-hens were particularly destroyed by the frost.

At Plandome, on the north side of Long-Island, twenty-five miles east of New-York, Singleton Mitchill, Esq. observed that the 23d December was a warm and pleasant day, with a southerly wind. About midnight it suddenly shifted to the northwest, and blew so furiously that almost every vessel caught between Hell-Gate and Montauk Point was driven ashore. The snow began about one o'clock on the morning of the 24th, and continued until about three in the afternoon. At four in the morning the wind veered to the north. The quicksilver fell to the eighth degree, in the hall of the house; and if exposed to the open weather, would have sunk nine or ten degrees lower.

At Sag Harbour, Henry P. Dering, Esq. remarked that the evening of the 23d was moderate, and almost a calm, until near midnight. The sky, however, was overcast, and somewhat lowering. The wind then shifted suddenly from the southward to about north, and blew with uncommon violence. It shortly after began to snow, and the tempest swelled to a hurricane. The vessels at the wharf received considerable damage. Several of them parted their fasts and drove ashore.

At Litchfield, in Connecticut, in about latitude forty-two degrees north, the sun rose clear on the morning of the 23d, and the weather was mild. But it grew cold until near noon, when the wind came round to the southeast. The weather then moderated, and was misty, though the wind was yet chilly. The snow on the ground became soft, and appearances indicated rain. But about four o'clock in the afternoon it began to snow, and this continued without any wind until ten o'clock, P. M. Afterwards, about two o'clock in the morning of Tuesday the 24th, the storm had become violent, both as respected snow and wind; and a furious gale blew from the north, or nearly north, until some time in the night of the 24th. Many sheep, in this county, froze to death. One man lost ten cows out of sixteen, and some of them were congealed in the erect posture, standing upon their legs.

It appears from these facts, that the commotion in the atmosphere on this occasion, had become very serious off Cape Hatteras as early as 8 o'clock, P. M., of the 23d. It had commenced at New-York by midnight. The snow had began to fall at Plandome by one o'clock on the morning of the 24th; by two, at New-London, and by four, at Boston.

This amounts to eight hours of difference in the time of its commencement off Cape Hatteras, and of its beginning at Boston; and computing the distance between these two places to be six hundred miles, the storm must have advanced to windward at the rate of seventy-five miles an hour.

No. IV.

HINTS *relative to the most Eligible Method of conducting* METEOROLOGICAL OBSERVATIONS. *By* JOHN GRISCOM, *Member of the Medical Faculty of Queen's College, New-Brunswick, (New-Jersey,) Professor of Chemistry in Columbia College, &c.*

[Read before the Society December 8th, 1814.]

AN accurate register of a careful and extensive series of observations on atmospherical phenomena, under the direction of this society, might, it is conceived, very usefully contribute to enlarge our knowledge of the nature of those changes, so important to human welfare, and to throw into the common stock of philosophy, facts conducive to its advancement.

Vicissitudes of weather are regarded, by the greater part of mankind, as events altogether fortuitous in their nature, and subject to influences, the precise order of which cannot be ascertained.

Philosophers cannot, indeed, boast of much progress in this field of discovery. Governed, as those changes doubtless are, by chemical, rather than by mechanical laws, it is not to be expected that mankind will ever arrive at that perfection of knowledge, with respect to these phenomena, which has crowned their labours in relation to the heavenly bodies. But, although an acquaintance with the ultimate principles upon which atmospheric changes depend, may never be attained, it is scarcely to be doubted, that a diligent course of observation and experiment, performed by men of science, in various parts of the globe,

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would furnish results which might serve as a foundation for a theory much more perfect than any which has been proposed.

Facts of such common occurrence, and so fully within the reach of observation, as are those of wind, rain, storms, changes of temperature, &c. are, doubtless, susceptible of arrangement and classification, as well as those in other departments of natural science. It is well known that people whose peculiar situations and employments habitually stimulate them to these observations, acquire an unusual degree of skill in the prognosis of weather.

It is thus that shepherds and sea-faring men become deeply versed in the varying physiognomy of the sky. But the knowledge thus incidentally acquired, and insulated from public convenience, were it reduced to something like method and system, might be attained and communicated with the same facility and rapidity as other portions of physical science.

The invention and use of instruments, especially of the thermometer and barometer, have enabled the moderns to arrive at much greater precision than the ancients in their acquaintance with the nature of the atmosphere, and of its agency in the operations of the globe. But the application of those instruments has hitherto been too much limited to a few whom curiosity has occasionally prompted to employ them. In the operation of causes which are coextensive with whole climates, and wide-spread regions of the earth, it is not to be expected that a few detached observations can be sufficient to establish general laws.

We live in a period, however, in which the spirit of philosophy seems more than ever awake to the interests of humanity; and deriving, as we do, so many important advantages from the sagacity and industry of our progenitors, it becomes our reasonable duty to extend the same benefits, as far as we are able, in a progressive ratio to our successors.

Grounded upon views of this nature, an opinion of the importance of accurate and numerous meteorological observations appears recently to have prevailed in many places, especially in Great Britain.

We are not aware of there being any complete regular series of observations kept in this country. We know, at least, of no journal in which such a series is registered. It appears to *us*[*] very desirable that this deficiency should be supplied: and we should willingly hope that an example, fairly held up by this society, would be followed by similar associations in other parts of the United States.

We proceed to an enumeration of those particulars which we consider as the principal desiderata in observations of this nature.

1st. *Changes of temperature.*

In the choice of a thermometer, as the standard of temperature, great care should be taken that the instrument be well made. The diversity so frequently observable in thermometers under the same exposure, arises principally from the want of a complete expulsion of air from the tube, and from imperfect graduation. For the estimation of sudden changes of temperature, thermometers with cylindrical reservoirs are preferable to those which are globular.

The mean heat of the atmosphere is so easily affected by irregular currents of air through halls, entries, and other situations within the walls of a building, that it is deemed absolutely necessary, in order to arrive at the standard temperature, that the instrument be exposed to the open air, sheltered only from the sun and rain. A situation which we consider the most favourable, would be a post, placed at some distance from any building which might reflect heat, and surrounded, in the warm season, to the distance of ten or twelve feet by verdure. A sloping roof should encompass the post to protect the instrument from direct rays, but not so as to prevent a free and uninterrupted circulation of air. Beside an instrument of the ordinary construction, thus situated for determining the mean temperature of the air, as deduced from three stated observations in every twenty-four hours, viz. at 8 o'clock, A. M., 1 P. M., and 6 P. M., we would recommend that the society procure, if possible, a good Six's, or self-registering thermometer, by which the greatest heat of the day, and the greatest cold of the night, can be determined by bare inspection, several hours afterwards. The highest intensity of solar heat, as indicated by the thermometer, is obtained when the instrument is protected by a box of glass from aerial agitations, and exposed to the direct influence of the sun beams. The posterior side of the box may be of wood, and its internal surface should be painted black, or lined with black cloth. The highest elevations of an instrument thus adjusted, during our hottest weather, would, if carefully registered, form an interesting addition to the observations usually noted.

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[*] This paper was read as the report of a committee appointed to consider of the subject to which it relates.

2d. *Changes of atmospheric pressure.*

We have only to recommend that the barometer employed for this purpose be a good one; that it be furnished with a nonius for reading off the elevations to hundredths of an inch; that the figure of the mercurial surface be noted, with the elevations, whether concave, convex, or horizontal; and that, in addition to the regular observations, the height of the quicksilver in this instrument be attended to as far as the observer can conveniently do it, in all remarkable states of weather, more especially with respect to winds and storms.

The height of the place of observation, in feet, above the level of the sea, should be carefully ascertained.

We deem it of some importance to remark, that of the several methods practised of registering the daily heights of the thermometer and barometer, that which may be called the graphic method, which consists in drawing a line in conformity to the elevations and depressions of the mercury across a sheet, divided by lines which correspond with the scale of the instrument, appears to be preferable to any other. It might be best, however, at least once a day, to note, in numbers, the precise elevation.

3d. *The amount of condensed vapour.*

The instrument principally to be relied upon, for this purpose, is the pluviameter, or rain gauge.

We deem it unnecessary to point out what we conceive to be the best method of constructing this instrument. The committee which shall be chosen to execute the orders o the society in relation to the subjects of this report, will, necessarily, avail themselves, in directing its construction, of such hints given by the best writers on philosophy, as they may think worthy of attention. The instrument should be placed as near the surface of the earth as circumstances will admit; as it is well ascertained that, in such a situation, more rain will be caught than in a position considerably elevated above it. As an accurate employment of the rain gauge is particularly desirable, the careful attention of the observer will be requisite, during the fall of snow, to collect exactly that portion which falls within the exposed circumference of the instrument, and to melt it without any loss by evaporation.

4th. *Changes in the direction and force of the wind.*

In order to ascertain the quarter from whence the wind blows, any of the city, vanes which are known to turn easily, and which are within the reach of the observer's eye, may, perhaps, be sufficient. It would, however, in our opinion, be desirable that an instrument combining the properties of an anemoscope with those of an anemometer, which determines the relative force and velocity of the wind, should be provided as soon as the funds of the society will justify a little expenditure for this purpose. Various instruments have been contrived for measuring the force of wind; but we believe the one invented by the celebrated Kirwan is by far the most complete. It is described in the transactions of the Irish Academy, and in the 34th volume of Tilloch's Philosophical Magazine. By this the strength of the wind, from a gentle breeze to the most violent hurricane, may be exactly measured.

The subjects now enumerated, are considered *essential* in every course of meteorological observations, which has the ordinary aim either of curiosity or information. But to render such a series complete; to make a collection of facts that may be held up as an example, and serve as the basis of useful induction to those who shall come after us, there are various other phenomena which, we think, ought not, on an occasion of this nature, to be neglected. The committee hope not to trespass beyond the proper limits of their duty in attempting a brief detail of those which they consider the most important.

The relative quantity of moisture contained in the atmosphere at any given period, is an object, the knowledge of which is desirable not only for the purpose of comparison, but in an especial manner as the means of improving the theory of evaporation and condensation. Hygrometers of different kinds, and depending on different principles, have been employed for this purpose. That contrived by Lieutenant Kater we have ascertained to be very sensible in its operation. Professor Leslie, of Edinburgh, has invented several instruments for this purpose, which have simplicity and facility of management to recommend them. They are particularly described in his late work on the "Relations of Air to Heat and Moisture." It is well known that in warm weather a common drinking glass is a good hygrometer; for when the internal surface is refrigerated by pouring in a cold fluid, the moisture which condenses externally, affords an indication of the quantity existing in the atmosphere, which, when excessive, is considered by many as presaging a change of weather. Such indications, when remarkable, are worthy of being registered by the daily observer; and we would recommend that the person appointed to keep the meteoric register should be instructed to note the state of the hygrometer.

Before a correct, or, at least, a complete, theory of the weather can be arrived at, it will, in all probability, be requisite that greater advances be made in our knowledge of the *electrical* changes that take place in the atmosphere during the transitions from heat to cold, from foul to fair, and the contrary. To ascertain this point effectually is no easy task. It will require great patience and assiduity of attention. But though an extensive course of electrical observations, persevered in for a long time, might prove too laborious, it would still be desirable to note the observance of those changes which occur in all the most remarkable revolutions of the elements. This could be done by means of an insulated spire, or an electrical kite, or, with still greater facility and cheapness, though less effectually, by the atmospherical electrometer of Saussure, or the more simple instrument of Cavallo. We have observed remarks of this nature in some of the meteorological journals of Europe,

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and cannot but consider them as adding value to the series of journalized events.

However fleeting and changeable the forms and arrangement of the clouds may appear to an ordinary observer, it is, we know, upon such forms and arrangements that the judgment is most correctly founded, with respect to the probability of an alteration of weather. But the skill of the weather-wise, for want of a more precise, technical language, remains almost altogether empirical. An attempt to remedy this defect, was made some years ago by Luke Howard, by the invention of a nomenclature applicable to the various forms of suspended water; or, in other words, to the modifications of clouds. "By modification is to be understood, simply, the structure or manner of aggregation, not the precise form or magnitude; which, indeed, varies every moment in most clouds. The principal modifications," he observes, "are commonly as distinguishable from each other as a tree from a hill, or a hill from a lake; although clouds of the same modification, considered with respect to each other, have often only the common resemblances which exist among trees, hills, or lakes taken generally."

"There are," he finds, "but three simple and distinct modifications, which he thus names and defines:

"1st. Cirrus. A cloud resembling a lock of hair, or a feather. Parallel, flexuous, or diverging fibres, unlimited in the direction of their increase.

"2d. The Cumulus. A cloud which increases from above, in dense, convex, or conical heaps.

"3d. The Stratus. An extended, continuous, level sheet of cloud, increasing from beneath.

"There are two modifications which appear to be of an intermediate nature; these are

"The Cirro-Cumulus. A connected system of small roundish clouds, placed in close order, or contact.

"The Cirro-Stratus. A horizontal, or slightly inclined, sheet, attenuated at its circumference, concave downward, or undulated. Groups or patches having these characters.

"Lastly, there are two modifications which exhibit a compound structure, viz.

"The Cumulo-Stratus. A cloud in which the structure of the cumulus is mixed with that of the cirro-stratus, or cirro-cumulus. The cumulus flattened at top, and overhanging its base; and

"The Nimbus. A dense cloud, spreading out into a crown of cirrus, and passing beneath into a shower."

These modifications are defined with such further precision and minuteness as to enable a person, of common intelligence, by the aid of a little observation, to understand and to apply the terms. And to render the daily insertion of these characteristic traits of weather more easy, each modification may be represented by a short mark, or character, which may be arranged in a column under the head of clouds. Considering the facility with which such a list may be kept, the committee would recommend its adoption. They observe, that among the numerous diaries of the weather which are published in the foreign journals, that which is kept by the author of the essay on the clouds appears to be one of the most instructive.

In mountainous countries, the figure, position, and motion of the clouds, afford, to the experienced observer, the means of prognosticating, with very considerable accuracy, the approaching state of weather, although their appearances are very deceptive to persons accustomed to view them only as suspended over a widely extended horizon. A course of judicious observations on the atmosphere in a number of such situations would, doubtless, make a valuable addition to the present stock of meteorological facts.

There are but few opinions, in relation to the subject before us, more general, than that which ascribes to the moon a determinate influence over the atmosphere. It is of material consequence, we conceive, that this opinion should be brought to the test of ample experience by regular and widely extended observation. The most careful set of observations, relative to this part of the science of meteorology, which appears on record, is that of M. Toaldo. The inferences which he draws from a cautious comparison of the weather with the corresponding positions of the moon, during the long period of one thousand one hundred lunations, are to the following amount:

There are ten situations of the moon in each lunation important to meteorology, viz. the four quarters, the perigee, the apogee, the two passages of the equator, (ascending and descending equinoxes,) and the two lunistices, as they are termed by La Lande, viz. the north, when the moon approaches the zenith, and the south, when it is most depressed. Then, the probability of a change of weather, compared with the probability of no change, is as follows:

At New moon,	6	to	1
Full moon,	5		1
First quarter,	2 1-2		1
Third quarter,	2 1-2		1
Perigee,	7		1
Apogee,	4		1
Ascending equinox,	3 3-4		1
Descending do.	2 3-4		1
Southern lunistice,	3		1
Northern do.	2 3-4		1

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When several of these points correspond, the probability of change is much increased. Thus, if the new moon happen at the turn of the

perigee, the chance is as	33	to	1
do. with apogee,	7		1
Full moon with perigee,	10		1
do. with apogee,	8		1

Although there are several considerations, unnecessary to be now introduced, which lessen the dependence that might otherwise be placed on these results, yet every meteorological register, we think, should contain a column exhibiting the aspects of the moon, with the period, at least, of the apogee and perigee.

A collation of numerous diaries of this sort may, at some future day, either confirm, or totally invalidate, the opinion entertained by some philosophers, that terrestrial as well as celestial events have regular periods of return; and that there are cycles of weather corresponding with some of the lunar cycles.

The period of the apogee comprehends between eight and nine years; and, according to Toaldo, there is a return of nearly the same seasons in those periods successively. Others place greater confidence in the lunar cycle of nineteen years. The ancients, according to Pliny, ascribed to certain periods, a similarity of weather and seasons. But unless it can be shown that the corresponding portions of those periods take place at the same time of year nearly, which is clearly not the case with the period of the apses, they cannot be entitled to much credit. But it may, nevertheless, be not improbable that a cycle of greater duration may be eventually found, in the return of which there will be a complete recurrence of all those states and conditions with respect to planetary and elemental revolutions, that shall conspire to produce the same phenomena.

There is another species of meteorology, very frequently attended to by those who reside in the country, and which is considered by some as susceptible of much precision, and rarely defective in its results. It is that which regards changes announced by prognostics drawn from animals, plants, and every thing which indicates changes of atmosphere.* A good journalist should not hesitate to insert any remarkable presage of this nature. The domestic fowl, the swallow, the hog, the horse, and other animals, may thus contribute to the extension of useful science. Plants which fold their petals and leaves in the night, and usually open in the day, are delicately affected by incipient changes in the air. The Calendula Pluvialis derives its name from this property, which is said to be very decisive.

An unusual transparency of atmosphere, in which distant objects become visible by refraction, and which favours the propagation of sound in an uncommon degree; the perpendicular ascent of smoke, and a more than usual stillness and serenity of nature, are likewise to be taken into the account.

But, among the various objects which claim the attention of the meteorological observer, he must, by no means, omit those from which his science, in its strict and literal acceptation, derives its name. The phenomena of meteors constitute an interesting part of natural history. Hence every remarkable appearance of fire balls, shooting stars, ignes fatui, together with the aurora borealis, zodiacal light, halos, parhelia, para selena, lunar rainbows, and other analogous occurrences, ought to be diligently observed, and carefully noted.

Finally, we recommend, as a very useful addition to the series of facts brought into view, that the period of the first appearance of early flowers, in open and exposed situations, in the spring of every year, designated by their botanical names, be noted, with as much precision as the circumstances of the observer will admit. It would likewise be proper to remark the first or earliest visits of the swallow, martin, and other birds, and likewise those of some of the aquatic tribes, as the mackerel, shad, &c.

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* Vide Rozier's Cour Complêt d'Agriculture, Art. Presage.

Information of this kind would probably afford, to persons at a distance, more correct data, from which they might draw conclusions with respect to the nature of our climate, than the best register of the weather, and of the instruments which denote its temperature and its changes.

Extract of a letter dated Cincinnati, November 9, 1814, *from Dr. N. Crookshank to Dr. Peter Wilson, Columbia College.*

"On the 4th of June last, about meridian, a dark cloud appeared in or near the southwest point of the horizon, having the usual appearances of electricity, as was known, by the hemispherical or convex appearances of various parts on the superior sides of the different shelves composing it; while the lower part appeared parallel to the earth. Some light clouds were seen to move with great rapidity from the northeast, and appeared to meet the former; when both seemed to rise perpendicularly several degrees, so as to attain an extraordinary height. I then predicted hail, which presently fell, of uncommon size. Several were picked up after the shower, which ended in rain, too large to put into a cup four inches in diameter. Others were picked up in the time of the fall, thirteen, fourteen, and even fifteen, inches in circumference: yet, strange to tell, no material damage was done, though the width of the shower was five miles, and twenty or thirty in length; the tract of the largest hail, in centre of the former, about a mile. It appeared to consist of several clouds detached from each other, and moving in echelon, so as to appear as if the hail had fallen in stripes. Providentially there was but little wind, and the number of hail stones comparatively few. The larger pieces appeared to be aggregated of numerous others, which were likewise composed of smaller ones. Some, however, of more than ordinary size, appeared single, as if they had been snow balls immersed in water, and refrozen. The largest of these I saw resembled the section of a large hen's egg. About 5 P. M. the same afternoon, a hot or very warm current of air passed over, of such temperature and composition, as to threaten those who breathed it with instant death. Their only remedy was by stooping down near the earth. It actually did prove fatal to the leaves, and parts of leaves of many vegetables, by which means its traces were discovered above sixty miles, along and near the Ohio river. Near Cincinnati it whitened the points of the green blades of a whole field of oats. Its causes are a proper subject of investigation for your society; and I cannot help thinking, that whoever discovers them, must become a literary creditor to those who have derived the sirocco wind from the sandy deserts of Arabia.

"N. B. The current of hot air happened entirely out of the tract of the hail, to the southward and eastward of it."

No. V.

The FISHES OF NEW-YORK, *described and arranged. By* SAMUEL L. MITCHILL, M. D. *Professor of Natural History in the University of New-York, one of the Corresponding Secretaries of the Literary and Philosophical Society, &c.*

[Read before the Society 8th of December, 1814.]

IN the present arrangement I have distributed the fishes into five orders; to wit, APODAL, when they are destitute of ventral fins; JUGULAR, when these are situated on the neck; THORACIC, when they grow on the breast; ABDOMINAL, when they arise from the belly.

These four orders comprehend the fishes that have bones.

The cartilaginous fishes, which have been divided by several very able zoölogists into two orders, the *chondropterygious*, or those which have leathery fins, and the *branchiostegious*, or such as have concealed gills, are here included in a single order of CARTILAGINOUS; making the fifth division of the class.

The fishes of New-York, as far as they have come to my knowledge, may be exhibited in the following table:

Section I. Bony Fishes.

APODAL.

Anguilla, eel,	2 species, with their varieties.
Muræna,	1

Ophidium,	2	
Ammodytes, launce,	1	
Trichiurus, hair tail,	1	
Stromateus, harvest fish,	2	
		9 species.

JUGULAR.

Gadus, cod,	10 species, with their varieties.	
Blenny,	3	
		13 species.

THORACIC.

Echeneis, remora,	2 species.	
Coryphene, or sailor's dolphin,	1	
Goby,	1	
Cottus, bullhead,	3	
Scorpœna,	1	
Zeus, dory,	3	
Pleuronectes, flounder,	7 with their varieties.	
Sparus, sheep's head,	1	
Labrus, porgy, weakfish, tautog, and others,	10	
Sciœna, drums,	3	
Perca, rockfish, sea basse,	2	
Bodian, white, black, and yellow perch, &c.	7	
Scomber, mackarel,	7	
Gasterosteus, stickle back,	2	
Trigla, gurnard,	2	
		52 species.

ABDOMINAL.

Silure, catfish,	2	
Salmo, trout, salmon, smelt,	3	
Fistularia, pipe fish,	2	
Esox, pike,	9	
Elops,	1	
Exocœtus, flying fish,	3	
Polyneme,	1	
Atherine, silver side,	3	
Mullet,	1	
Clupea, herring,	13	
Cyprinus, carp,	4	
		42

Making of bony fishes, 116 species.

Section II. Cartilaginous Fishes.

FIFTH ORDER.

Petromyzon, lamprey,	1
Accipenser, sturgeon,	2
Lophius, angler,	2
Balistes, filefish,	3
Diodon,	2
Cephalus, head fish,	1
Tetraodon,	3
Syngnathus, sea horse,	2
Raja, skate, sting ray, &c.	5
Squalus, shark, dog fish,	8
Cyclopterus, lumpsucker,	1
Pegasus,	1

Making of cartilaginous fishes, 31 species.

The species thus are:

Bony fishes,	116
Cartilaginous,	31
	147

Amounting to one hundred and forty-seven species of fishes embraced in my memoir.

To these I add some memorable varieties, which present themselves to the eye of every observer, and ought to be noticed by the naturalist. Among the more distinguishable forms of these are,

Of the Common Cod, or dorse,	2 varieties.
Tomcod,	5
Flounder,	2
Tautog,	3
Bergall,	1
Weakfish,	1
Rock fish,	2
Pike gudgeon,	3
	19 varieties.

Amounting to nineteen well-defined varieties of the New-York fishes.

The enumeration now stands thus:

Species of New-York fishes,	147
Varieties of the same,	19
Species and varieties,	166

I have had before me, during my inquiries, the Leyden copy of the *Museum Icthyologicum*, by L. T. Gronovius, 1754, fol.; Castel's French edition of Bloch's *Histoire Naturelle des Poissons*, Paris, 10 tom. 12mo. 1801; Gmelin's edition of Linne's *Systema Naturæ*, with Tur-

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TON's English translation; and the *ichthyological part* of SHAW's *General Zoology*, as published in London.

From the latter of these works I have copied the generic characters which illustrate the species that I have described.

I need scarcely mention, that the splendid works of CATESBY and EDWARDS have been constantly at my elbow.

I feel a peculiar pleasure in stating my obligations to the labours of my assiduous and excellent friends, SAMUEL AKERLY and SAMUEL G. MOTT, of the city of New-York, physicians. The former of these gentlemen drew from nature most of the figures which accompany this memoir; and the latter, by his activity and vigilance, detected many of the individuals, which, without his aid, might not have come to my knowledge. I owe them much for the drawings and specimens with which they have supplied me. Science will never cease to respect them both.

To JAMES INDERWICK, Esq. I also am indebted for several graphical representations. To his skill in delineation, and to his cultivatd mind, I am highly gratified in bearing testimony.

NEW-YORK FISHES.

Order, APODES.

ANGUILLA. EEL.

Character.

Head smooth. Nostrils tubular. Eyes covered by the common skin. Gill membrane, ten rayed. Body roundish, smooth, mucous. Dorsal, caudal, and anal fins united. Spiracles behind the head or pectoral fins.

1. *Common eel.* (*Anguilla vulgaris.*) Olive brown eel, subargenteous beneath, with the lower jaw longer than the upper.

Agrees in the main with the common eel of the books, though there seems to be some variety in the number of the rays in his fins. He is sometimes brown on the back, and yellow on the belly; and occasionally black above, and dusky below. Has been known to weigh twelve pounds and a half, as taken in the bay of New-York. The largest one I have heard of was caught in one of the south bays of Long-Island, and weighed sixteen pounds and a half.

The eel is brought to the New-York market at all seasons of the year. In the summer he is taken in nets, and in baskets made of wooden splinters, called *eel-pots.* He is also taken by the hook; and in summer evenings by a bunch of tough bait, after a manner called *bobbing.* In the winter eels lie concealed in the mud, and are taken in great numbers by spears. It is a common custom in New-York for the fishmongers to skin them; and vast quantities of eels are disposed of in that way.

The roes or ovaria of eels may be seen, by those who will look for them in the proper season, like those of other fish. By inattentive observers they may be mistaken for masses of fat. For some curious facts on the production of eels in the New-York waters, the Medical Repository may be consulted, vol. 10th, p. 201—203.

2. *Conger eel.* (*Anguilla conger.*) Dark brown, whitish below, and a lateral line dotted with white.

I examined a living one on the 7th July, 1814, which was thirty-seven inches in length, seven and a half in girth, and weighed three pounds and eleven ounces. Flesh white, and very dainty eating. Colour of the back and sides, a very dark brown; sometimes lighter on and near the fins, of which those on the back and belly are tipped or margined with black. Lateral line distinct, and noted by a row of white dots. Belly and neck a dirty white. The fairest parts are behind the pectoral fins. Upper jaw longer than the lower. Lips skinny and thick. Each jaw furnished with a thickset row of minute teeth, presenting a serrated or ragged edge, inclined toward the throat. Teeth gathered into a patch at the forepart of the palate. Tongue broad and smooth. Throat wide and capacious. Eyes large and bright. In addition to the nostrils there are four orifices near the extremity of the snout. The anal, caudal, and dorsal fins are united, and jointly contained five hundred and thirty-nine rays. For the purpose of numbering them exactly, the skin was taken off.

Rays, B. 9. P. 17. D. C. & A. 539.

MURÆNA.

Generic character.

Body eel-shaped. Pectoral fins none. Spiracle on each side of the neck.

Sea snake. (*Muræna meleagris.*) A specimen with small mouth, rows of sharp teeth, spotted body, and dorsal fin continued round the tail to the anal, in Scudder's Museum. Length two feet and more than a half.

OPHIDIUM.

Character.

Head somewhat naked. Teeth in the jaws, palate, and throat. Branchiastegous membrane seven rayed, patulous. Body ensiform.

1. *Spinous ophidium.* (*Ophidium mucronatum.*) With a minute spine on the sternum, and another opposite to it in front of the dorsal fin.

Length seven inches; depth one. Has a peculiar odour when first taken, in the opinion of some persons, like that of boiled crabs. Skin smooth and scaleless. Lateral line almost straight, and near the middle. Body ensiform, or flattened sideways, and tapering toward the tail. When held up to the light, the backbone can be distinguished. The pectoral fins small, rounded, and yellow, composed of twelve or thirteen rays. Between them and the sternum is a minute spine, and another at the commencement of the dorsal, right opposite to it.

Head rather small, and distinguished from the body by a groove or depression. Cheeks have a distended or inflated appearance. Mouth somewhat contracted; and the jaws furnished each with a row of sharp little teeth. Eyes large, approximated, and of a reddish yellow hue. Gill membrane five rayed, and projecting over the lower side of the neck. Belly, pectoral and caudal fins yellow. Branchial membrane of the same colour, but paler. Anal fin narrow, and yellowish, but alternated with pale brown spots, or marks, to the number of sixteen, or thereabout. Dorsal of a similar hue, though more faint than the others, and reaching almost from the back of the head, in the form of a narrow fillet, quite to the caudal.

The anal fin is not so wide as the dorsal; and extends from the vent to the caudal.

From the points of junction with the caudal and anal, the caudal proceeds in a rounded or convex and delicate form, composed of eleven or twelve rays. The skin is of a dark brown, with indistinct spots and clouds; and, by careful inspection, ten or more darker spots can be traced straddling the back, and bestriding the dorsal fin. Caught in the salt water at Brooklyn.

2. *Cirrhous ophidium.* (*Ophidium barbatum.*) With a beard of unequal cirrhi, hyaline body, and a black border around the dorsal, caudal, and anal fins.

Length full nine inches; depth almost one and a half; thickness three quarters. Scales few, very minute and deciduous. Head moderate. Upper jaw projects over the lower, and receives it. Small file-like teeth in the jaws, palate, and throat. Eyes large and white. Body semi-transparent, and allowing the vertebræ to be half visible through it. Dorsal and anal fins united round the tail, and neatly trimmed with a black border. A speckled stripe on each side of the dorsal fin. Lateral line gently curved to the back, and running through a radiated or stellated stripe. Beneath this a row of indistinct spots; and under them, in the abdominal parts, six or seven faint clouds Belly white, with yellow pectoral fins, and a yellowish tinge about the neck and chin.

But the most remarkable feature of this fish is a cirrhus of four divisions, proceeding from the middle of the branchial membrane. Two of these are on the right, and two on the left. One pair is about an inch and a quarter long, and the other pair half that length. All the four arise from a common base; and the long one and short one on each side seem to be but branches from the same root. They almost resemble bifid ventral fins.

AMMODYTES. LAUNCE.

Generic character.

Head compressed, narrower than the body. Upper lip doubled. Lower jaw narrow, pointed. Teeth small, sharp. Gill membrane seven rayed. Body long, roundish, with very small scales. Tail distinct.

Sand launce. (*Ammodytes tobianus.*) With the lower jaw longer than the upper. Length from eight to twelve inches. Colour silvery white. Dorsal fin in a groove; and the other characters corresponding to the descriptions of the modern ichthyologists.

TRICHIURUS. HAIR-TAIL.

Generic character.

Head stretched forwards, with lateral gill-covers. Teeth ensiform, semi-saggitated at the tips. Gill membrane, seven rayed. Body ensiform, compressed, with subulate finless tail.

Silvery hair-tail. (*Trichiurus argenteus.*) With the lower jaw jutting beyond the upper, and a snake-like tail.

Length two feet and four inches; depth at the belly two inches and a half. I measured one, August 1, 1814, that was three feet and two inches long, which weighed one pound and a quarter. Figure flat, and thin sideways. Colour silvery, with a golden lateral line. This descends from the gill opening, and runs low along the belly. Dorsal fin reaches from the back of the head almost to the tail, which is finless, and ends in an attenuated point. No anal nor ventral fins; but a row of notches or spines along the tail, as far forward as the vent, rendering it somewhat carinated. Gill openings wide. Eyes yellow, and occupy much space in the flat vertical cheeks. Space between the eyes flattish, giving the head an angular configuration. Nostrils ample. Mouth capacious, and jaws armed with teeth. Lower jaw projects, and has two teeth jutting beyond the upper, when the mouth is shut. The upper jaw has, in front, from three to six teeth longer than the rest. All the teeth of the larger order are jagged on the inner or hinder sides, with a single barb toward their points. Throat capacious, and tongue smooth. No scales. Laterally the teeth of the upper jaw project over the sides of the lower. And when the jaws are closed it is frequently possible to look through the mouth from side to side.

There is a specimen of trichiure in Mr. Scudder's Museum, that is alleged to have been swallowed by another fish. Both are preserved in a bottle. The swallower seems to be a mackerel, and is really smaller than the fish he forced down his throat. The effort cost him his life, by bursting the stomach and the belly; and two creatures are shown as proofs of the fact.

STROMATEUS. BROAD SHINER.

Generic character.

Head compressed. Teeth both in jaws and palate. Body rhombic-ovate, compressed, lubricous.

1. *Cryptous broad shiner.* (*Stromateus cryptosus.*) With a row of holes on each side of the back. A curious and beautiful fish, eight inches long, and five deep. Body flat laterally. Head rounded in with the body. Mouth small. Jaws have a fine serrated margin. Tongue distinct, smooth, and spotted. Palate and inside of the mouth also spotted. Gill openings narrow. A small spine just behind the vent. From its blunt head the body increases to the aforesaid width, and then becomes very narrow near the tail.

Dorsal fin reaches from the top of the back almost to the tail; anal from the neighbourhood of the before-mentioned spine to the root of the tail.

Three lateral lines; middle one straight, running from the upper part of the gill opening to the middle of the tail. The upper one forms a curve upward, the extremities of which almost touch the extremities of the straight line, resembling an arch and its chord. The lower one is about equally curved downward, and its ends approach about as near to the middle line. Middle and lower lines smooth, while the upper one is roughened with scales. Few or no other scales on the skin.

Colour along the back a pale ash, with tints of blue and green. On each side of the dorsal fin, twenty-two or more openings in the skin, like excretory ducts, in a longitudinal direction. In front of the dorsal fin, a spine directed forward. Remaining colour, a lucid white, reflecting light from the broad side, in variegated iridescent tints. Sometimes there is a smutty patch behind the pectoral fin.

No teeth in the palate or throat; but the stomach contains an apparatus of toothed projections to aid concoction. The sides are marked from back to belly with parallel waved or zigzag lines; but those lines are not tints of the skin. Caudal fin deeply forked. Lower jaw shuts within the upper, and has the appearance, after death, of seeming longer as it gapes open. Rays, Br. 7. P. 20. D. 45. A. 37. C. 25. A delicate fish to eat.

2. *Harvest fish.* (*Stromateus longipinnis.*) With extended dorsal and anal fins.

So called by some of the fishermen, because he visits the coast about the season of harvest. Length scarcely seven inches; depth four, and including the dorsal and anal fins, more than six; thickness not above one. Head short, blunt, and associated with the body. Nose obtuse, and rather receding toward the upper lip. Mouth small. Lower jaw shuts within the upper. Lips beset with minute serrated teeth. Tongue, palate, and throat, smooth and spotted. Skin silvery, with tints of blue, green, and iridescent. A cloudy patch extending from the nose toward the dorsal fin, and over the eyebrow to the gill opening. Inky patches now and then on the belly and toward the tail, which change their hues according to the angle of light, and in certain positions, appear beautifully red and purple. Back bluish, with occasional clouds. First fifteen dorsal rays longer than the rest, and five or six of them measure almost two inches.

The foremost six or seven of the anal more than two inches in length.

Tail deeply forked. Waving parallel zigzag lines, distinguishable on the broad side. Vent far forward. Is broader and shorter than the cryptosus. Fine eating.

Rays, Br. 5. P. 21. D. 44. A. 44. C. 19.

Order, JUGULARES.

COD. GADUS.

Generic character.

Head smooth. Gill membrane seven rayed. Body oblong, covered with deciduous scales. Fins all covered by the common skin. Dorsal and anal generally more than one, the rays unarmed; ventral fins slender, ending in a point.

* Codfish with three dorsal fins, and bearded mouth.

1. *Bank cod.* (*Gadus morhua.*) Great cod fish, of an ashen colour, with yellowish spots, broadish scales, and first ray of the anal fin stiff or spinous.

This fish is found at times in the New-York market, being caught in the sea near Nantucket, and beyond. We get him, however, only in the cool season; for the summer temperature of our waters kills him. He is, therefore, only found between November and April.

The character is so exactly that of the later European writers, that I deem it unnecessary to give a particular description of him. He is not common on our stalls. But the species next to be mentioned is much more frequent.

2. *Common cod of New-York.* (*Gadus callarias.*) With ashen back, white belly, head and body spotted with brown; even tail, and projecting upper jaw.

A middle-sized fish of this species is twenty-five inches long, and weighs five pounds and a half. Colour pale; also prettily spotted with yellowish. The lateral line grows broader and plainer until it reaches the part of the body situated between the third dorsal and second anal fin. It is nearly straight until it reaches the place of a line drawn perpendicularly from the vent. Tail even. Jaws, palate, and throat, all toothed. Lower jaw has one row of teeth; upper several. First and second rays of the ventral fins separated or bifid; and their hue reddish, or whitish. No spines upon the anal, or any other fins. Upper jaw longer than the lower.

I have noted this fish as the *Dorse*, or *Gadus callarias*, notwithstanding his great size, and some other well-marked differences. Should the character not correspond, he must be considered a distinct species.

Of this fish there is a remarkable variety, denominated

(a The *Shoal-cod*, or *School-cod*, (*Gadus arenosus*,) which is specifically the same with the preceding, but has less of the yellow complexion. The hue is more of a greenish brown, with spots of less distinctness. The fishermen say that the shoal-cod is taken on the level and sandy bottoms, while the yellowish or *rock-cod*, to be immediately mentioned, is caught on the rough grounds; and perhaps this reason is a practical and sufficient one.

There is a further variety, called

(b) The *Rock-cod*, (*Gadus rupestris*,) which is chiefly distinguished by his dwarfish size, rusty complexion, and more chubby shape.

3. *Tom cod*, (*Gadus tomcodus*.) The length is about ten or twelve inches. Snout round and blunt. Mouth considerably under, and of a moderate size. Small teeth in the jaws, palate, and throat. Tongue distinct, white, fleshy, and small. Lateral line incurvated upward. Ventral fins bifid. The second ray longer than the first. Eyes small and yellowish. Tail convex.

This fish appears under various forms, which makes his history difficult to write. I shall attempt an enumeration of the principal.

(a) *G. tomcodus fuscus*, or *brown tom cod;* with the back and upper parts of the sides a mottled brown or olive. Chin and belly often carnation.

(b) *G. tomcodus luteus*, or *yellow tom cod;* with darker brown or olive on the back and sides, intermixed with yellow there, and along the belly.

(c) *G. T. luteo-pallidus*, or *yellowish white tom cod;* with yellow and white mixed with different shades of brown and olive.

(d) *G. T. pruinosus*, or *frostfish;* has been supposed by some to be a different species. The reasons of this opinion are, 1. That the frostfish is said to be smaller; 2. That in the frostfish the first ray of the ventral fin is the longest, whereas, in the tom cod, the second ray is the longest; and, 3. In the frostfish there are five, six, or more bars or zones of a brown colour along the sides, while the tom cod is merely mottled. He is called *frostfish* because of his appearance more abundantly after the commencement of the frosts in November; though he is caught in the salt waters of New-York all the year round. There has been a variance noted in the rays of his fins wide enough, in the judgment of some, to make him a distinct species.

(e) *G. T. mixtus*, or *mixed tom cod;* with yet other modifications of colours, and with variations in the rays of the fins.

Still the species and all its varieties are called, without any discrimination, tom cod, or frostfish, according to the fisherman's fancy.

The difference of sex and age evidently increases the varieties of this species. And so numerous and perplexing are they, that the specific name might, with propriety, be *multiform*, or *G. polymorphus*.

As far as I can ascertain, by reiterated countings, the more usual number of the rays in the fins is as follows: branchial, seven; ventral, six; pectoral, seventeen; dorsals, thirteen, eighteen, and nineteen; anals, twenty-two and eighteen; caudal, thirty-nine.

4. *Haddock.* (*Gadus æglefinus.*) Has a whitish skin, a black lateral line, forked tail, and an upper jaw longer than the lower.

Is occasionally found among the other species of Gadus in the New-York market; and in addition to the before-mentioned characters, is distinguished by the dusky cast of his back, his large eyes, and small round scales. Length, when full grown, about twenty inches.

5. *Blennoid Cod.* (*Gadus blennoides.*) So called from his resemblance to a blenny. The mouth has minute rows of sharp teeth in both jaws. Two toothed spots or patches on the palate. Throat streaked lengthwise. Lateral line curved. Eyes large. Colour brown, but less so on the belly than back. Flesh soft. Vent nearer the head than tail. Ventral fins bifid, and extending like threads. Tail even; or rather projecting toward the middle rays. The branchial rays are six; pectoral, thirteen; dorsal, ten, sixteen, thirty-six; ventral, two; anal, forty-five; caudal, twenty-three.

* * Codfish with three dorsal fins, and beardless mouth.

6. *New-York Pollack.* (*Gadus purpureus.*) With greenish, spotless back, forked tail, and purplish fins.

His length is about twenty inches, and depth five. The snout is rather pointed. The lower jaw is longer than the upper. Tail divided. Ventral fins short and small. Colour of the lips, inside of the mouth, and gill-covers, purplish and dark. Jaws finely toothed. Small patches in the palate. Eyes large and silvery. Lateral line white, straight, and broad; becoming more short and narrow toward the tail.

Colour of the back a dusky olive, or bottle green, without spots. Sides and outer gill-covers pale, with tints of yellowish, and becoming whiter at the belly and chin. Dorsal and pectoral fins dusky green; caudal and both anals purple; ventrals faintly reddish; though there is some diversity in these particulars. The rays in the fins are Br. 7. V. 6. D. 15—19—23. P. 21. A. 20—19.

* * * Codfishes with two dorsal fins.

7. *Hake.* (*Gadus merluccius.*) With double rows of sharp teeth; broad and scaly lateral line; beardless chin, and even tail.

The specimen before me is about fifteen inches long; two deep; and five in girth. Caught with the other cod. The head is rather long; and the body is slender, and tapers away to the tail. The colour of the back is a pale brown; of the belly a dirty white. No cirrhus to the chin. The mouth is wide and capacious. The lower jaw is longer than the upper; and both are armed with acute and hooked teeth, in a two rowed and formidable array. The back part of the tongue, the palate, and the throat, are also patched with teeth. The palate, throat, and lining of the gill-covers, are dark coloured. Grooves and channels on the top of the head. The eyes are very large, with a yellow iris and brown circumference. There are two dorsal fins, the foremost of which consists of twelve rays, and the hindmost of thirty-eight. The gill membrane has seven rays; the pectoral fin thirteen; the ventral seven; the anal forty-one; and the caudal twenty-seven.

The lateral line runs nearly straight from the upper part of the gill-opening, to the middle of the tail, and is furrowed in such a manner as to give it a broad and double appearance. The scales are deciduous from the back; more adhesive to the belly; and frequently stick to the line. There are five or six small warts in a row along the line not far from the gill opening. The ventral fins are shorter than the pectoral, and both are pointed. The vent is nearer the head. The extremity of the tail is even; and the gill cover is rather peaked behind.

8. *Slender Cod.* (*Gadus tenuis.*) With bearded chin, streaked throat, convex tail, and bifid ventral fins.

Is about fifteen inches long. Has brown back and sides; but not so much so below as above. The fins are dark brown, save the ventral, which are whitish and long, ending in red bifid extremities. Eyes of moderate size, and black. Lateral line curved upward. Mouth and palate furnished with sharp teeth. Tongue smooth. A small cirrhus beneath the chin. Tail roundish. Throat internally streaked with red and purple. Vent nearer the head. The rays in the fins are, Br. 7. V. 2. P. 16. D. 11—54. A. 44. C. 25.

9. *Codling.* (*Gadus longipes.*) With lanceolated body, very long ventral fins; and first ray of the anterior dorsal elongated and flexible.

Length about twenty inches; depth three and a half. The first ray of the first dorsal almost six inches long. Body long and tapering. Scales besmeared with slime, rendering them slippery, and rather obscure. Head sloping, roundish, and smooth. Eyes large and pale. Upper jaw projects. Beneath and within it a distinct moveable lip. Lower jaw shuts easily within this lip. The upper lip and lower jaw are furnished with rows of small teeth. Palate and throat also toothed. Tongue large, smooth, and fleshy. Sides of the tongue and inside of the throat smutty, or dotted with black. Mouth capacious; gill-openings ample. A small cirrhus under the chin. Weighs sometimes as heavy as eighteen pounds. The ventral fins are six inches long, bifid, tapering, and reddish.

The lateral line begins over the branchial opening, and runs nearly parallel with the back. Colour of the back and sides a ruddy brown; of the belly, white, tinged with yellowish. Dorsal and anal fins terminate abruptly, and leave a short unoccupied space between themselves and the tail; the body having at that place become narrow and slender.

This is the *hake* of the New-York fishermen.

Rays, B. 7. V. 2. P. 17. D. 10—54. A. 49. C. 21.

10. *Spotted Cod.* (*Gadus punctatus.*) With a black spot in the anterior dorsal fin, black-tipped anal fin, and speckled lateral line.

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Length, ten inches; depth, nearly three. Figure, that of a fish with a small head, large body, and rather diminutive tail.

Colour of the back and sides, pale brown, or whitish; with lines between the scales. Hue of the neck and belly, a dull white, with suffusions of cream colour. Two dorsal fins; of which the foremost has eight or nine rays. It is brown for a short distance above the back; then becomes white; above, it exhibits the form of a black spot; is surmounted by the white tips, or summits of the rays.

The second dorsal consists of about forty-seven oblique rays; and reaches almost to the tail. It varies but little from the colour of the back.

The anal fin reaches almost all the way from the vent to the tail. It consists also of about forty-seven rays. It is browner than the contiguous parts. Its extremity, or lower margin, is black.

The ventral fins are two cleft; and lilac or flesh coloured; second ray is two inches long.

The pectoral fins are thirteen rayed, and roundish. Caudal fin, twenty-three rayed, tapering at the sides, and nearly even at the end.

Lateral line distinct and peculiar; consisting of a narrow black mark, extending from the upper part of the gill opening to the tail, and alternating at spaces of half an inch apart, with white dashes about one eighth of an inch long. The black and white of the lateral line make a striking and pretty appearance.

Chin has one small cirrhus. Lips, palate, and throat, armed with minute sharp teeth. Mouth capacious. Eyes large and whitish. Lower jaw shuts within the upper. Scales soft and very deciduous.

In some individuals there is an imperfect whitish straight fillet under the lateral line. This is one of the rarest of the enumerated species.

BLENNIUS. BLENNY.

Generic character.

Head sloping. Body lengthened, sub-compressed, lubricous. Gill membrane six rayed. Ventral fins two, three, or four rayed, unarmed.

* With plain head.

1. *Fringed Blenny.* (*Blennius ciliatus.*) With green-tipped teeth, white-bordered fins, and caudal fin united to the anal.

Length about twenty inches. In March, 1813, a considerable number of these fishes were exhibited in the New-York market. The head was large and shelving. Upper jaw projected over the lower, and received the lower within it. Teeth two rowed in the front of the lower jaw, and three rowed in the upper. Their points roundish and greenish. Chin smooth.

Dorsal fin reaches from the back of the head almost to the tail. Caudal fin united to the anal, and continued along to the vent. Ventral fins small, smooth, tapering to points, and not digitated nor branched. All the fins yellow almost to their edges, and there they are fringed all round with a white border.

Gill membrane has six rays; and the pectoral fins about twenty. The fish was good eating; but the bones, after cooking, neither turned green, nor became phosphorescent. Nor has the least further tint of greenness appeared from that time to this.

2. *Smooth Blenny.* (*Blennius pholis.*) With unadorned head, even body, brown line, with whitish marks lengthwise, and a half way lateral line.

The specimen now before me was brought immured between the shells of a dead oyster, from Chesapeake bay, in March, 1814. The length was three inches and a quarter; and the depth three quarters of an inch.

The head was large and fleshy. The mouth was furnished with a single row of fine, thickset and comb-like teeth, in front. These do not extend far back, but are found only in the forepart of the jaws.

The skin was soft and uniform, without scales. The colour was brown, with whitish clouds and lines along the back and sides, and of a paler hue on the belly. Fins brown, or of the complexion of the back.

The pectoral fins were broad, roundish, and composed of twelve rays. The dorsal fin extended from the back of the head almost to the tail, with a broad expansion; and possessed twenty-nine rays. The vent was about midway of the body; and the anal fin reached from it nearly to the tail, containing nineteen rays. The tail was rounded, and formed of fifteen rays. The ventral fins were two rayed, and slightly bifid.

The gill membrane contained six rays, and was closed beneath, leaving a narrow opening above and before the pectoral fin. The lateral line became indistinct, after forming a gentle curve about half the length of the fish; and, indeed, vanished, so as to be incapable of being traced any further.

3. *Large-lipped Blenny.* (*Blennius labrosus.*) With a broad upper lip; approximated eyes; smooth skin of a yellowish green or olive, with dusky clouds; anal, caudal, and dorsal fins united; and with white teeth in both the jaws, and in the throat.

The length of the individual before me is about twenty-eight inches; depth three inches and a half; and breadth across the jaws where the body is widest is nearly four inches. It was taken at sea among the cod fishes, and brought with them to market. The weight was three pounds and rather more than one half. The upper lip is uncommonly thick, and overhanging. The lower lip is also skinny and fleshy, but shuts completely within the upper. The gape of the mouth is very wide. The tongue broad, white, cushion-like, and smooth; the palate extensive, and likewise smooth. Both jaws beset with sharp white teeth, huddled in the front of each into two or three rows. The throat is very wide, and beset with two patches of teeth above the pharynx, and two rows beneath. The nostrils are tubular.

The gill membrane has six rays; it is united below, and opens backward toward the pectoral fin by a moderate slit. All the fins are covered by the common skin; and they are wholly destitute of spines and indurated processes of every kind. The eyes are approximated, rather small, and brownish. The snout is convex and fleshy; but not crested. The cheeks are puffed or pouched.

The colour olive, inclining somewhat to yellowish, interspersed with dusky clouds, along the back and sides; the belly paler, with a tincture of reddish. The front dusky, with smutty dashes over the cheeks, and a spot as large as a half dollar or more, on each side, between the eye and the gill cover.

The dorsal fin begins at the back of the neck, and is continued round in connexion with the caudal and anal, until it almost reaches the vent, which is nearer the head than the tail, and is only eleven inches from the extreme point of the upper jaw. These fins have somewhat of a greenish hue; and are fringed with a margin of orange, that is yellowish above, and ruddy beneath. There is, however, a break in the dorsal fin near the tail, and there the rays are short and spinous to the number of eight or nine.

From the broad head and flabby lips, the body becomes lanceolate, and tapers away, after the manner of cod fishes and eels toward the tail. The pectoral fins are obliquely rounded, large, and orange-coloured toward the middle and lower extremities. The ventral fins not more than three quarters of an inch long, situated near each other, two rayed, blunt, and orange coloured.

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The pectoral fin has about nineteen coarse rays; the anal fin has one hundred and three distinguishable rays; and the dorsal one hundred and twenty-five; beside the caudal expansion, where the rays are confused, and not easy to be counted. With the before-mentioned exception of a few stiff and sharp rays where the dorsal fin is interrupted, all the fins and processes are soft.

Described from nature on the 27th of March, 1815.

Order, THORACIC.

ECHENEIS. REMORA.

Generic character.

Head furnished above with a flat ovate, transversely sulcated shield. Gill membrane six rayed. Body without scales.

1. *Big Oceanic Sucker.* (*Echeneis neucrates.*) With olive brown back, dirty white belly, intermingled with green, and twenty-four bars across the shield above the head.

The living specimen which I examined fresh from the water, on the 8th of July, 1814 was in length thirty-one inches, in girth ten inches and a half; and weighed four pounds and eleven ounces.

Lower jaw jutted considerably beyond the upper; and the upper side of its point was rough, with short and small teeth, which could never come into contact with those in front of the upper jaw.

Figure of the shield above the head elliptical, rather inclined to oval; its longer diameter six inches and a half; its shorter two and three quarters. It contained twenty-four bars separated through the middle.

Upper jaw, palate, and tongue, rough, with grater-like teeth, that are small and blunt.

Colour of the back a dusky brown, or olive, interspersed with whitish clouds. Belly and neck dusky white, with carnation and green about the gill membrane, and greenish along the chin, cheeks, neck, pectoral fins, belly, vent, and root of anal fin away to the tail. Skin scaleless. Lateral line rather obscure, especially toward the tail. A whitish longitudinal cloud, on each side, near the belly.

Tail not convex; though my specimen might have been, perhaps, deficient in that part. Is evidently the species already known.

Rays, Br. 9. P. 19. V. 5. D. 34. A. 34. C. 21.

2. *Small oceanic sucker.* (*Echeneis remora.*) Brown sucker, with eighteen bars across the head, and a concave tail.

The specimen I have before me is the same with that called the Mediterranean remora. It has eighteen stripes across the shield, which is separated by a longitudinal bar. The flattened head, the small eyes, the prominent lower jaw, the uniform brown of the skin, the smoothness, and the lunated tail, are so well described in the books, that there is no need of enlarging this description.

CORYPHŒNA. SAILOR'S DOLPHIN.

Generic character.

Head sloping suddenly downwards. Gill membrane five rayed. Dorsal fin the length of the back.

Common Coryphene. (*Coryphæna hippuris.*) Blue green coryphene, with orange-coloured spots, sixty rays in the dorsal fin, and a forked tail.

This fish is well described in the books of modern writers, so correctly figured by their engravers, and so frequent in collections of natural history, that I forbear to give a circumstantial account of him.

GOBIUS. GOBY.

Generic character.

Eyes approximated. Gill membrane four rayed. Ventral fins united into the form of a funnel, or circular hollow.

Variegated Goby. (*Gobius viridi-pallidus.*) With pouched cheeks, rounded tail, and pale bars to the number of seven or eight, diversifying the greenish brown hue of the sides.

Is about two inches and a half long, and inhabits the bay of New-York. The eyes are approximated, and look upward. There is a groove along the middle of the back, in front of the dorsal fin. The gill-opening is rather small, its lower part being shut. The body is destitute of scales. The skin is smooth and greenish brown, with seven or eight perpendicular whitish streaks. The cheeks are plump, as if inflated, and give the head a turgid appearance.

There are two dorsal fins, the foremost of which has six rays, and the hindmost fourteen. The ventral fins are united into a sort of canal, or funnel, and enable the fish to fasten himself to rocks and stones. One of the individuals, now lying before me, adhered so firmly to a stone, that he was lifted out of water by an oysterman. The tail is convex, and composed of seventeen rays. That, and all the fins, dark brown, with a bluish shade in the dorsals, caudal, and anal.

Rays, Br. 4. P. 16. V. 12. A. 12.

COTTUS. BULLHEAD.

Generic character.

Head broader than the body, spiny. Eyes vertical, and furnished with a nictitating membrane. Gill membrane six rayed. Body (in most species) without scales, attenuated toward the tail. Dorsal fins (chiefly) two.

Eighteen-spined Bullhead. (*Cottus octodecem-spinosus.*) With white belly dashed with inky spots, two banded dorsal fins, and eighteen spines about the head.

Called *pig fish*, from the squeaking noise he makes immediately on being taken out of the water. Another of his names is *sculpin*. Length about twelve inches. Big, broad, long, channelled, and thorny head. Spines on the head, neck, and gill covers, to the number of nine on each side.

Upper lip distinct. That, and the lower jaw, beset with minute teeth; as are also the palate and throat. No tongue. Mouth wide and capacious. Lower jaw received within the upper. Body tapers away to the tail. Eyes large and approximated, and of a yellowish red colour. Lateral line rather prominent, feeling like a seam, and corresponding with the back. Skin without scales and whitish, with an irregular discolouration of brownish or muddy. Pectoral fins broad, oblique in their insertion, and yellowish, with broad zones. Ventral whitish, with inky stains. Dorsal, anal, and caudal, dark, with white bands. Belly white, and stained with atramentous blots. Gill openings ample.

Rays, Br. 6. P. 18. V. 3. D. 8—16. A. 13. C. 12.

2. *Brazen Bullhead.* (*Cottus æneus.*) With brass-coloured complexion, thorny head, and rusty blotches over the sides.

Length five inches and a half; depth one. Lateral line distinct enough to be felt, and straight. Colour below the line yellowish, or rather brass-coloured, with rusty blotches. Belly brassy white. Hue above the line pale brown, with ferruginous patches. All the fins except the ventral light, with darker stains. Ventrals white, with similar marks. Two dorsals.

Head, gill-covers, and thorax, armed with spines to the number of nine or ten, on each side; though those on the top of the head are less distinct. Body tapering away to the tail. Head large, rough, and bony. Mouth wide. Tongue large. Upper jaw projects, and admits the lower. Numerous minute teeth in the jaws, palate, and throat.

Rays, Br. 6. P. 15. V. 4. D. 10—14. A. 10. C. 15.

3. *Lasher Bullhead, or Father-lasher.* (*Cottus Scorpius.*) Brown bullhead, with whitish variegations, several spines on the head and upper jaw longer than the lower.

Length of my specimens not much above six inches. Head armed with spines and prickles; but less prominent than in the preceding species. Upper jaw receives the lower.

Colour brown, with whitish variegations, and a reddish tinge beneath. Belly white. Dorsal and anal fins run close to the tail. All the fins zone-spotted. Eyes vertical. Head broad; and the other characters very much like those ascribed to this fish in the books of ichthyology.

SCORPÆNA.

Generic character.

Head large, aculeated, cirrhose, obtuse, without scales, sub-compressed. Eyes placed near each other. Teeth in the jaws, palate, and throat. Gill membrane seven rayed. Body fleshy. Dorsal fin single, with the rays of the fore part spiny.

Yellow scorpæna. (*Scorpæna flava.*) With ten pairs of cirrihi on the upper lip, head and gill covers; with about an equal number of bony protuberances about the head and eyes; with six pairs of cirrhi beneath the lower jaw; and a tubercular (not a cirrhose) lateral line.

The length of the specimen now before me is fourteen inches; the breadth three and a quarter; and the depth two and a half. He resembles the bullheads by his large mouth, and knobby huge head. He has a distant affinity to the gurnards by his large and rounded pectoral fins; and the whiskers, at the extremities of the upper lip, have a remote similitude to the catfish's. He was taken at sea, with the cod fishes.

His colour, from head to tail, is of a fine lemon yellow, with trifling variegations of brown or blackish, on the sides and fins.

The head is rough and tubercular, but not spinous. About twenty knobs can be counted. Cirrhi grow out of the skin, near the upper lip, eyes, and cheeks, to the number of twenty or thereabout. Two, near the corners of the mouth, have the appearance of small mystaces.

The eyebrows are rough and knobbed. The space between them deeply channelled. The eyes brownish, lateral, and approximated.

The cirrhi to the lower jaw are twelve in number, and several of them are subdivided into fingered or foliated processes. On the lower lip are three.

There are abundance of sharp little teeth in the upper lip, in both jaws, and in the upper and lower parts of his wide and capacious throat.

The dorsal fin is single, and consists of twenty-nine rays. Of these the first sixteen are stiffer than the others, and ramentose. The break between this section of the dorsal rays, and the posterior one is such, that it almost appears as if there were two dorsal fins. This, however,

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is not the case. The posterior section has a rounded form when the rays are expanded.

The tail consists of about nineteen rays, which, like all the others in this fish, are coarse, and soft or cartilaginous. Their extremity is almost straight, or bordering rather on the convex form.

The anal fin consists of fifteen rays; and is opposite to the posterior section of the dorsal.

The pectoral fin has a broad and strong insection just behind the gill opening, and is composed of eighteen rays. It is large and rounded.

The ventral fins consist of three rays, in each of which the foremost is the stoutest.

The gill membrane is seven rayed.

The lateral line is marked by a row of skinny tubercles, and not by cirrhi.

The skin is scaleless, and loose, like that of some of the anglers, or species of lophius.

ZEUS. DORY.

Generic character.

Head compressed, sloping down. Upper lip arched by a transverse membrane. Tongue, in most instances, subulate. Body compressed, broad, sub-rhomboid, thin, and of a bright colour. Gill membrane with seven perpendicular rays, the lowest transverse. Dorsal fin in most species furnished with filiform projecting rays.

1. *Hair-finned Dory.* (*Zeus capillaris.*) With elongated dorsal rays, deeply forked tail, and lengthened ventral fins.

A rhomboidal, ill-shaped fish, four inches and a half long. Back bluish; sides and belly silvery. Scales none. Lateral line curved upward at the breast like the crook of the letter ᓚ.

First ray of the first dorsal fin hair shaped, and three inches and a half long. The second ray almost as long as the first. First, second, and third rays of the second dorsal fin two inches long. Five or six short and sharp spines on the back between the two. Ventral fins two inches long, and consisting each of four rays. First ray of the anal fin an inch long. The rays of this and of the second dorsal continued by successive insertions almost to the tail, which is very slender, and deeply forked.

Head slopes greatly. Gill-opening slants very much. Body thin, and distinguished by linear impressions. Jaws edged, but without teeth. In certain specimens, there are four or five banded marks along the back.

2. *Rostrated Dory.* (*Zeus rostratus.*) With an elongated snout, and with a single long ray to the first dorsal fin.

This fish very much resembles the preceding species; but yet differs in several respects. For the body is thinner; the snout is more prominent; the facial angle declines more from the perpendicular. There is a more considerable break, or depression, above the upper lip. The distance is greater from the tip of the chin to the neck. The depression is more considerable at the point where the branchial membrane joins the neck. The space between the branchial membrane and the ventral fins is more prominent. There is but one long ray, instead of two, to the first dorsal fin; and in this the branchial rays are open to the eye; whereas in the Z. setapinnis they are concealed by the edge of the gill-cover.

3. *Bristly Dory.* (*Zeus setapinnis.*) With forked tail, short rays to the fins, and those of the vent and back ending in bristly points.

Length eight inches and a half; depth four; thickness not more than one; being a narrow fish when measured from side to side, and deep from back to belly. Taken in the bay of New-York.

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Head sloping, gill-opening oblique, and eye round and large, like most others of this genus.

Skin scaleless. Back bluish. Sides and belly white and glossy. Ventral fins exceedingly small. One dorsal fin, consisting of twenty-two rays, that divide into hairy threads. Five spinous processes, with distinct insertions in front of it. One anal fin, composed of eighteen capillary rays like the dorsal. Both are continued back to the root of the tail. This is deeply forked, and is formed of about twenty-three rays.

Lateral line rather more like the letter ∽ than in the former species; for the curvature is complete, and in addition thereto, the straight part is continued some distance along below it.

The pectoral fin consists of seventeen rays, and is long and acuminated.

There are no long rays to any of the fins, either above or below.

PLEURONECTES. FLOUNDER.

Generic character.

Eyes both on the same side of the head. Body compressed, one side representing the back, and the other the abdomen.

The species of this genus have been distributed into two sections, according to the position of their eyes; one of the sections being called *dextrous*, because the eyes of the fish inclined to the right; while the other was denominated *sinistrous*, by reason of their inclination to the left. Bloch's rule to determine the situation of the eyes is a plain and good one; it is to raise the fish from his side, and place him erect on his belly, with his tail toward the face of the observer. Then the eyes are said to be on the right or left side, as the observer so situated shall pronounce.

But Shaw has made the discrimination extremely intricate, or unintelligible. He writes, that flounders "have the eyes *dextrous*, or toward the right, when the fish is laid with its coloured side upward, and with its abdomen toward the spectator; and *sinistrous*, when the eyes are toward the left, in the above situation of the fish." He has made a confused piece of work of this genus. Dextrous and sinistrous are mingled together; and there is a want of perspicuity throughout. For example, Bloch makes the turbot a sinistrous fish, and figures him so; but Shaw, who agrees with him in the principle, figures the same turbot as having the eyes on the right. To avoid this confusion, we must revert to Bloch's easy and practical rule.

* With eyes toward the right.

1. *Holibut.* (*Pleuronectes hippoglossus.*) This very large and excellent fish is brought plentifully to New-York alive, in the spring, and is distinguished by having an elongated smooth body, soft and mucilaginous fins, white beneath, and brown above. Grows to the size of three hundred pounds, and more. Is brought to us in smacks. Here he is regularly butchered, cut up and exhibited for sale, piece-meal. The head, fins, and flap are reckoned the most savoury parts. Is an exquisite fish for the table. He is so well described already, and so easily distinguishable from every other species, that a circumstantial account of him is deemed unnecessary.

Is brought to the New-York market as early in the season as the arrival of the shad and alewife, or herring; that is, about the end of March or beginning of April. They take him on the shoals of Nantucket, and in the tracts of ocean to the northward and eastward. He is caught sometimes as far south as Sandy-Hook, before the water loses its wintry coldness. As the warmth increases, the holibut changes his ground; for they suppose the summer temperature unfavourable to him. Therefore, at that season he migrates to the banks of Nova Scotia

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and Newfoundland, and there enjoys a coolness that is congenial to his nature. In the spring he returns.

The bait employed for catching him is small herring. Generally the last holibut is sold in the New-York market about the first of June: and this is so well understood, that there is then commonly an advance of price.

The flesh is white and nutritious; and may be cooked in almost any way.

2. *New-York Flatfish.* (*Pleuronectes planus.*) With a spine at the commencement of the anal fin, back uniformly dark, and lateral line a little curved.

Lives in the bays and inlets along the coast, nestling and wintering in the mud. Body oblong and smooth. Back of an unmixed dark brown. Belly a clear white. Lateral line crooked a little. Tail rather convex. Caudal fin frequently reddish. Mouth small. Lower jaw rather prominent. Grows to the size of a foot long, and five inches broad. A spine at the commencement of the anal fin. Is called the winter flounder.

Rays, Br. 7. P. 9. V. 6. D. 62. A. 46. C. 17.

(a) *P. p. with a yellow margin on the lower side surrounding the white of that side.* This jaundice-coloured border is about three quarters of an inch in breadth, and makes a striking contrast with the pearl of the contiguous parts within it, and the brown of the adjacent dorsal, caudal, and anal fins.

(b) *P. p. with a white back.* The individual now before me, (April 9, 1815,) has a whiteness of the upper side nearly as clear as that of the nether surface, over rather more than half its extent. The anterior part is blanched in this manner. The dorsal fin very sensibly partakes of the altered hue; but its dark brown is tinctured with yellow, especially on the rays. Something of the same kind, though less distinct, is observable on the ventral fins, and on about a dozen rays of the anal.

The line of demarkation between the dark and the white parts of the back was not regular and definite. It was broken and irregular, going in a sort of abrupt and ragged course across. The white part was not regularly so. Around the eyes, on the gill-cover, at and above the insertion of the pectoral fin, and along the lateral line, were cloudy spots, of different extent, and several of them of nearly the original dark complexion. These spots on the white ground of the skin had a very close resemblance to some cases I have seen of the partial remains here and there of the original blackness in the skin of negroes, that were undergoing the change to white men. The length was five inches; and the breadth three.

3. *New-York Sole.* (*Pleuronectes mollis.*) With cross-striped back, calico-spotted belly, and soft mucous body, without pectoral fins.

A small, ugly, and forbidding fish, of about six or seven inches long, a somewhat oval shape, and three or four broad. Is soft and mucous, without a spine or prickle about him.

Back dark brown, striped transversely, that is, from the dorsal to the anal fin, with five or more entire black lines, some imperfect ones, and occasionally rounded and oblong spots and marks.

Anal, dorsal, and caudal fins, striped through with black, though there are sometimes interruptions, especially in the tail.

Pectoral fins wholly wanting. Eyes minute and approximated. Mouth small, oblique, and toothless. Back overlays the upper jaw, and, from its projecting extremity, the dorsal fin begins, and extends almost to the tail.

Belly pale brown, or rather a dirty white, overspread with roundish or circular spots of dusky brown, exhibiting a calico appearance.

Nether side of both jaws covered with soft warts or tubercles, extending some distance along the dorsal fin, and over the gill-cover. The small mouth seems to be concealed, as it were, among the surrounding parts. Delicate eating.

Rays, Br. 4. V. 4. P. 0. D. 56. A. 40. C. 16.

* * With eyes to the left.

4. *Plaice of New-York.* (*Pleuronectes aquosus.*) With spots of black, and white or silvery on the back, semi-transparent body, and variegated fins.

A middle-sized fish, measured nine inches from nose to tail, and when the dorsal and anal fins were expanded, five and three quarters across. Another of the largest magnitude was eleven inches long, and eight broad. Is taken in the same place with the P. planus; that is, in our shallow bays and coves.

Back brown, interspersed with blackish brown spots. In some individuals a white spot at the origin of the superior pectoral fin; and silvery specks over the head, back, and fins, resembling small flakes of mica. Eyes yellowish.

Edges of the foremost dorsal rays white, as they sometimes double under. Lower ventral white. Fins, mostly, however, variegated with oblong spots.

Mouth oblique and moderate. A protuberance on the chin. Body delicate, and semi-diaphanous. Dorsal fin commences between the right eye and the upper lip. Tail convex. Back, belly, and fins smooth, and free from spines and roughness. Teeth small, though sharp.

From his pellucidity, he is sometimes called the *watery flounder*.

Rays, Br. 7. P. 12. V. 6. D. 65. A. 54. C. 17.

This fish has, by some of our sportsmen and epicures, been called turbot; but they who call him so, show their entire ignorance of ichthyology.

5. *Flounder of New-York.* (*Pleuronectes dentatus.*) **With wide, toothed, oblique mouth, and pale brown uniform back.**

Grows to the size of twenty-four inches long, and twelve broad, in the south bays of Long-Island, and weighs five pounds. I have seen him even larger and heavier than that. There is considerable variety in his colours and spots.

Mouth oblique, wide, and capacious. Teeth distinct, prominent, and sharp.

Colour of the back and fins commonly a pale brown, without lines or spots; and yet varieties occur, where the spotted appearance is very plain.

Back, belly, and fins smooth, and not spinous. Belly, in the younger fish, partly opaque white, and partly semi-transparent white. Lateral line curved at the thorax. Comes in plenty to the market, and is a remarkably good fish to eat. Is so well characterized in the books, that a more minute description is deemed unnecessary. Is called the summer flounder.

Rays, Br. 6. P. 12. V. 6. D. 96. A. 73. C. 17.

6. *Black-bellied Flounder.* (*Pleuronectes melanogaster.*) **With black belly, notched back, and whitish pectoral fins.**

This very peculiar fish was bought in the New-York market, on the first day of June, 1814. Length fourteen inches and a half; breadth six and a half.

Eyes on the left. Mouth oblique, wide, and sharply toothed; and the other features resembling the P. dentatus.

But the singularity of this specimen was, that the belly was almost as dark coloured as the back; the hue being only a shade lighter. The nether pectoral fin had an approximation to white, from its middle toward the end, and the upper one was somewhat whitish near the tip.

The eyes were high up; the upper one being almost on the back of the head. There was a notch over which a shoulder projected from the neck a quarter of an inch forward. The dorsal fin commenced from the anterior point of that projection.

There was, besides, a singular resemblance in the scales of the back and belly. They were so much alike, that a superficial observer would suppose the fish was one that swam perpendicularly. The rays of the dorsal and anal fins were the only ones that differed from the preceding, of which he is, probably, but a variety.

Rays, Br. 6. P. 12. D. 84. V. 6. A. 66. C. 17.

7. *Spotted Flounder.* (*Pleuronectes oblongus.*) With spineless body, four spots on his back, and prominent angular tail.

I examined this fish June 30th, 1814, and found his length to be fifteen inches, and his breadth six. He comes in between the P. maculatus, and the P. dentatus; and is rather a soft and mucous fish; with eyes to the left.

Mouth large, oblique, and toothed. Teeth distinct and acute. Eyes pale yellow, broad, approximated, and separated by a bony ridge.

Lateral line incurved at the thorax, and thence running palpably and visibly straight to the tail.

Colour of the back a mixture of pale brownish and whitish specks, with a sort of semi-hyaline complexion like the watery flounder. Though he has, too, a resemblance to the P. dentatus, he is a longer and a narrower fish, as I found by comparing the fresh specimens. Extremities of some of the anal and caudal rays whitish.

The uniformity of colour is interrupted by four dark spots on the back, two on each side of the lateral line. One of the two on each side, is about midway of the length, and the other near the tail. The former are about three quarters of an inch in diameter; the latter not so considerable.

Tail angular; that is, the middle ray makes almost a rectangle with the side rays, it is so much longer.

Belly white, with a mixture of the *watery* appearance; and a tinge of the ruddy, especially in the region of the anal fin. The dorsal fin begins in front of the upper eye. No spine or prickle any where about him. A whitish spot about the origin of the pectoral fin.

Rays, Br. 6. P. 11. V. 6. D. 73. A. 59. C. 17.

SPARUS.

Generic character.

Teeth strong. Front teeth, in some species, disposed in a single row. In others in a double, treble, or quadruple row. Grinders, in most species, convex, smooth, and disposed in ranges, forming a kind of pavement in the mouth. Lips thick. Gill-covers unarmed, smooth, scaly.

Sheep's Head. (*Sparus ovis.*) With smutty face, banded sides, pale complexion, prominent eyebrow, and grooved spinous dorsal fin.

Grows big enough to weigh fourteen or fifteen pounds. One that weighed four pounds and a half measured twenty inches in length, eight in depth, and three in thickness. Sheep's head is the most esteemed of the New-York fishes, and fetches a higher price than any, excepting, perhaps, fresh salmon and trout. The price varies from a dollar to one hundred and fifty cents for a fish of middle size; that is, from four to seven pounds. Nothing, in the opinion of a New-Yorker, can exceed boiled sheep's head served up at a sumptuous dinner.

The form of the mouth, and a certain smuttiness of the face, have a distant resemblance to the physiognomy of the sheep. Thence comes the name by which he is usually distinguished.

Teeth covered by the lips, which are large and distinct. Four *inci-*

sors in each jaw; and two other teeth situated next to them, one on each side, that may be considered as *canine*. The former are straight; the latter rather turned inwards. Within, and beyond these, two or three rows of round-topped grinders, making a bony pavement, as it were, inside of the mouth. No cirrhus or roughness of any kind on the head, neck, or snout. Lower jaw shorter than the upper.

Nostrils double. Eyes large, vertical, brown, and connected by a prominent brow. Head united to the body, without any proper neck. Gill-covers broad and smooth. Opening ample. From a scaly spot a little above the branchial aperture, proceeds a coloured and curved streak to the withers. A single dorsal fin, strong and spinous, lowering into a deep furrow the greater part of its course.

The expanded tail measures six inches across, and is neatly concave, or almost lunated. A scaly process near the insertion of the ventral fin.

Lateral line almost corresponds with the arch of the back, and radiates prettily on the scales over which it passes.

General colour of the sheep's head a white, or obscure silvery, with a smutty daubing over the face and chin, a greenish tinge above the brow, and six or seven dark bands or zones of an inch or more in breadth, regularly slanting from back to belly. The latter, a dull white, approaching, in some places and individuals, to cream colour.

Scales large, horny, distinguished by radiated and concentric lines; and somewhat like a square rounded a little at the corners. They are deeply inserted into the skin; adhere with remarkable firmness; and when they are separated, there is discoverable, on the edges of the skin, which enclosed them, a sort of tarnished argentine, or brightish leaden hue. Rays of all the fins coarse.

The pectorals are long and pointed. Tongue white and smooth.

The intestines of the individual I last dissected were lengthy, convoluted, and filled with the fragments of several sorts of crabs. Swimming bladder capacious and thick. Peritoneum, on opening the abdomen, blackish. Two patches of teeth in the upper part of the throat, and two smaller corresponding patches on the lower part, a short distance in front of the entrance of the gullet. But all of these are very inferior in strength and size to those of the mouth.

This noble fish visits the neighbourhood of Long-Island annually. Emerging from the depths of the ocean, he finds, in the recesses and inlets there, a plenty of the crabs, muscles, and clams on which he loves to feed. He confines himself strictly to the salt water, never having been seen in the fresh rivers. His term of continuance is only during the warmest season; that is, from the beginning of June to the middle of September. He then departs to the unknown depths of the Atlantic, and is seen no more until the ensuing summer. I have, however, known him to stay later; for one of the most numerous collections of sheep's head I ever saw in the New-York market, was on the 4th October, 1814. I have seen him as late as the 17th.

The sheep's head swims in shoals, and is sometimes surrounded in great numbers by the seine. Several hundreds have often been taken at a single haul, with the long sweeping nets in use, near Raynortown, Babylon, and Fire-Island. They even tell of a thousand brought to land at a draught.

He also bites at the hook, and several are not unfrequently caught in succession. The outfit of a sheep's heading party is always an occasion of considerable parade and high expectation, as I have often experienced. Whenever a sheep's head is brought on board the boat, more joy is manifested than by the possession of any other kind of fish. The sportsmen view the exercise so much above common fishing, that the capture of the sheep's head is the most desirable combination of luck with skill; and the feats of hooking and pulling him in, furnish abundant materials for the most pleasing and hyperbolical stories. The sheep's head is a very stout fish, and the hooks and lines are strong in proportion. Yet he frequently breaks them, and makes his escape. Sheep's head have been caught with such fishing tackle fastened to their jaws. When the line or hook gives way, the accident makes a serious impression upon the company. As the possession of the sheep's head is a grand prize, so his escape is felt as a distressing loss. I knew an ancient fisherman who used to record, in a book, the time, place, and circumstance of every sheep's head he had caught.

This fish is sometimes speared by torch-light, in the wide and shallow bays of Queen's county and Suffolk.

The places where he is found in the greatest abundance are about forty miles from the city. He soon dies after being removed from his element, and in such sultry weather, soon spoils after death. They, therefore, remove his entrails, lay him in the water of the coldest springs and brooks, and transport him to market during the coolness of night, with all possible speed, in wagons. Yet, after all, he is too frequently decayed or tainted before dinner time, and thrown away as unfit to eat.

When ice houses shall be established near the fishing places, and along the roads, sheep's head will be brought to New-York in perfection. The transportation of sea fish, in a frozen state, from Long-Branch, in New-Jersey, to Philadelphia, has afforded, to the Pennsylvanians, the specious argument, that their sea basse and black fish, after a transportation of fifty miles by land, are really preferable to the sickly, wounded, lingering, and emaciated fish of New-York.

It is to be regretted the sheep's head too often corrupts for want of ice.

Rays, Br. 4. V. 6. P. 6. D. 24. A. 13. C. 19.

LABRUS.

Generic character.

Teeth strong and sub-acute. The grinders sometimes, as in the Sparus family, convex and crowded. Lips thick and doubled. Rays of the dorsal fin, in certain sorts, lengthened into soft or ragged processes. Gill-covers unarmed, and scaly.

1. *Weak Fish.* (*Labrus squeteague.*) With even tail, speckled back and sides, one or more sharp long front teeth in the upper jaw, and yellowish ventral and anal fins.

One of the most numerous and useful of the New-York fishes; particularly during the season when the cold is not considerable. Size commonly from a foot to fifteen inches; but often grows larger. I weighed one, for example, that measured twenty-seven inches in length, by seven in depth, and found him heavier than six pounds.

He never goes into fresh streams, or ponds, but, within the limits of the salt water, is taken in almost all the places where rock fish is caught.

The weak fish is so much the companion of the basse, that I once gave him the specific name of *comes.*

He resembles the rock in the following particulars: 1. A wide mouth, with small teeth in the lips and jaws; 2. Patches of teeth at the bottom of a capacious throat; 3. Two dorsal fins, the foremost of which has eight rays; 4. A lateral line passing into the caudal fin; 5. A nearly corresponding number of sixteen rays in the pectoral, and seventeen in the caudal, fins; 6. Double nostrils, and an elongated lower jaw; 7. A projecting head; and, 8. Large pale yellow eyes on its sides.

But there are no tangible serræ on the gill-cover. The divisions at

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the edge are visible only. They are not bony, but yield to the gentlest touch.

Also, the gill-cover is not fairly tripartite; but consists of no more than two plain divisions.

From a point near the upper and forepart of the posterior gill-plate, there is an appearance of two or three darkish lines radiating toward its extremity, backward and downward. But these, though they are evident enough to the sight, give nothing bony or sharp to the touch. The finger does not find any thing spinous or aculeated where the eye led to the belief of such a structure.

The weak fish cannot, therefore, be deemed a *perca*. I have been obliged to separate him from his companion, the rock, notwithstanding their numerous points of similitude.

I have, upon the whole, associated him with the great family of *Labrus*; a connexion for which he seems to be qualified by his smooth and scaly gill-covers, his sharp and strong teeth, and the softness of his dorsal rays.

I have given him the specific name by which the Narraganset natives distinguish him, *Squeteague*. It would have been as easy to have assigned the Mohegan appellative, *Checouts*.

Head and back of the weak fish brown, with frequently a tinge of greenish. The spaces toward the sides faintly silvery, with dusky specks. These gradually disappear on the sides, until, on descending to the belly, a clear white prevails from the chin to the tail.

Mouth wide. Jaws toothed; and in the upper mandible, one, two, or three teeth, in front, longer and stronger than the rest; and resembling the fangs of serpents.

Throat, in front of the esophagus, armed above and below with collections of small teeth.

Eight softish rays in the foremost dorsal fin. Pectoral, dorsal, and caudal fins, light, or pale brown, inclining sometimes to yellowish. Anal and ventral fins pale yellow.

Tail even. Lower jaw longer than the upper.

Lateral line arched upward; and after its descent, runs quite to the extremity of the caudal fin.

Tongue yellow, with minute black dots around the forepart; concave, with a soft and flexible margin; has a frœnum.

The swimming bladder is convertible to good glue. I have eaten as fine blancmange from it, as from the isinglass of the sturgeon.

He is a fish of a goodly appearance; and is wholesome and well tasted, though rather soft. Is brought to market in great numbers during the summer months. He is taken both by the line and the seine. He is called *weak* fish, as some say, because he does not pull very hard after he is hooked; or, as others allege, because labouring men, who are fed upon him, are *weak*, by reason of the deficient nourishment in that kind of food.

Certain peculiar noises under water, of a low, rumbling, or drumming kind, are ascribed, by the fishermen, to the squeteague. Whether the sounds come from these fishes or not, it is certain that during their season, they may be heard coming from the bottom of the water; and in places frequented by weak fish; and not in other places; and when the weak fish depart, the sounds are no more heard.

Rays, Br. 7. P. 16. V. 5. D. 8—28. A. 13. C. 17.

A beautiful variety of this fish is sometimes seen with the following characters, to wit:

Spotted Squeteague. (*Lab. sq. maculatus.*) There are black, well-defined *spots* among the *specks* over the back and sides, and chequering the caudal and second dorsal fins. The pectoral fins are rather smaller. Ventral and anal fins not yellow, but brownish.

The parts thus variegated with spots have a pretty appearance.

2. ***Black-Fish, or Tautog.*** (*Labrus tautoga.*) With head and gill-covers smooth; lips thick, and covering the teeth; one row of distinct teeth in each jaw, with rudiments of more; patches of teeth in the throat; and a single dorsal fin.

Black-fish of New-York. Tautog of the Mohegans. Tide black-fish, or runners. The name of this fish is derived from the colour of its back and sides, being of a bluish, or crow black. Lips, lower jaw, neck, and belly, white, particularly in the males. Mouth rather small. Lips skinny or fleshy. Teeth, to about the number of twelve, in each of the jaws: the two front ones are the largest, and the rest of the respective rows gradually decrease in size. Within the regular empalements, are the points of smaller teeth, inserted with rather less regularity; they are sharp, distinct, and covered by the lips. Tongue white, smooth, lying close, but discoverable by raising. Tail entire, and somewhat convex, the middle rays being rather more prominent than the upper and lower ones.

Gill-cover smooth, and neither scaly, serrated, nor rough. Extremities of the pectoral fins whitish. Nostrils double. Eyes rather small. Back rounded upward, and belly downward, which, together with his well-covered cheeks and head, give him a very plump appearance.

Has a triangular patch of teeth, making a sort of bony pavement, in the lower part of his throat; and two roundish patches in the upper part, just before the orifice of the gullet. The seventeen first rays of the dorsal fin project with naked spines; and to each is annexed a ramentose process. Two spinous rays behind the vent.

Rays, Br. 5. P. 15. V. 6. D. 28. A. 9. C. 15.

The black-fish abounds in the vicinity of Long-Island, and is a stationary inhabitant of the salt water. He never visits the rivers, like salmon or sturgeon; nor, on the other hand, deserts his dwelling-place as they do. He is fond of rocks, reefs, and rough bottoms. He is taken through the whole course of Long-Island sound, Fisher's-Island sound, and in the neighbourhood of Rhode-Island. The tautog was not originally known in Massachusetts bay; but, within a few years, he has been carried beyond Cape Cod, and has multiplied so abundantly, that the Boston market has now a full supply, without the necessity of importing from Newport and Providence. Black-fish, however, does not confine himself to rough bottoms; for he is also caught in the southern bays of Long-Island, and on the banks of the ocean off Sandy-Hook.

He is considered, by the New-Yorkers, as a very fine fish for the table. The price is from eight to twelve cents a pound. He grows to the weight of ten or twelve pounds, and even more; but it is a fish of good size, that equals two and three.

He may be kept for a long time in ponds or cars; and fed, and even fatted there. When the cold of winter benumbs him, he refuses to eat any more, and a membrane is observed to form over the vent, and close it. He begins to regain appetite with the return of warmth in the spring. The blossoming of the dog-wood, (cornus florida,) early in April, is understood to denote the time of baiting black-fish. As soon as these flowers unfold, the fishermen proceed with their hooks and lines to the favourite places. If there is no dogwood, a judgment is derived from the vegetation of the chesnut-tree (castanea vesca.) The season of biting is reckoned very favourable until the increasing warmth of the season brings food enough to fill their stomachs, and they thereupon afford less pastime to the sportsmen, and less profit to the professed fishermen. The people express this sentiment in these coarse rhymes:

When chesnut leaves are as big as thumb-nail,
Then bite black fish without fail;
But when chesnut leaves are as long as a span,
Then catch black-fish, if you can.

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The common bait for black-fish is the soft clam or pisser, (mya.) The soldier crab or fiddler, (ocypoda,) will frequently tempt him when he refuses to taste the other. And he snaps very readily at the large finny worm of the salt-water beaches, (nereis,) when used on a hook for him.

Some persons, who live contiguous to the shores where are situated the rocks frequented by tautog, invite the fish there by baiting. By this is meant, the throwing overboard broken clams or crabs to induce the black-fish to renew their visits; and fine sport is procured.

Rocky shores and bottoms are the haunts of black-fish. Long experience is required to find all these places of resort. Nice observations on the land-marks in different directions are requisite to enable a fishing party to anchor on the proper spot. When, for example, a certain rock and tree range one way, with a barn window appearing over a headland the other way, the boat lying at the point where two such lines intersect each other, is exactly over some famous rendezvous. To ensure success on such an expedition, it is proper to have a pilot along, well versed in all the local and minute knowledge. According to the number and distance of the rocks and reefs visited will be the time consumed, from the duration of a few hours to a long summer's day. An opinion prevails, that black-fish can hear very well; and, for fear of scaring them away, the greatest stillness is observed. He is a strong fish, and pulls well for one of his weight and size.

At some places black-fish bite best upon the flood. In others they are voracious during the ebb. Thunder accompanying a shower, is an indication that no more of them can be caught. The appearance of a porpus infallibly puts an end to the sport. Curious stories are told of fish in the wells and prisons, floating in their native element, having been found dead after sharp and repeated flashes of lightning. Dull weather, with an easterly wind, is generally the omen of ill luck.

The exploits performed in fishing for tautog are recounted occasionally with remarkable glee, and they afford a never-failing theme of entertainment to those who are engaged in this sort of adventure. Though the hand-line is generally used, the rod is sometimes employed to great advantage. The black-fish is remarkable for retaining life a long time after he is taken out of water. He sometimes swims over even ground, and is caught in seines.

There are several varieties, all of which may be occasionally viewed at once on the fishmongers' stalls.

(a) *L. T. fusca.* With bands and zones of a brown colour, and the whole complexion brown.

(b) *L. T. rubens.* With clouds and shades of reddish hue, giving tints to the whole fish.

(c) *L. T. alia.* With yet other mottles, clouds, and marks.

3. *Bergall of New-York.* (*Labrus chogset.*) Chogset of the Mohegans. Blue-fish.

This fish seldom grows more than seven or eight inches long; nor equals as many ounces in weight. Is found in all the waters frequented by black-fish. Lives on the same food, and is very troublesome to fishermen by nibbling away their bait. This pesters them the more, because the hooks for black-fish are too large for the mouths of the bergalls. The resemblance of the chogset to tautog is so striking, that he might be called a black-fish in miniature. It is a large bergall that weighs ten ounces; yet I have seen them heavier than sixteen.

Mouth rather small. Lips distinct, and covering the teeth. When turned back, a grinning appearance is produced. Jaws furnished with a row of sharp, short, and separate teeth; and smaller ones appearing in the gums behind them. There are about sixteen teeth in the upper jaw, and twenty-eight in the lower; beside the irregular and scattering ones. Head smooth and fleshy. About seventeen of the dorsal rays have naked spinous points, and are ramentose between.

Lateral line curved upward, and consisting of a succession of oblique oblong dots. Three ramentose spines before the anal fin. Tail broad, convex, or rather longest about the middle rays. Tongue white and smooth. Colour bluish, bordering on green. The green is plainest about the gill-covers, anal fin, and ventrals. Sometimes the back faintly clouded, and variegated with orange specks. A neat little fish, and tenacious of life when exposed to the air, though less so than the black-fish. A triangular pavement of teeth in the throat below, and two oblong patches above, just before the gullet.

Rays, Br. 5. P. 15. V. 6. D. 28. A. 9. C. 15.

There is a remarkable variety of the chogset, viz.

L. C. fulva. Yellow bergall. A reddish yellow over the whole surface is the distinguishing feature. This is, by some, conjectured to be owing to confinement in cars, or wells of smacks; and in some degree to the coldness of the water in winter. Whether these suppositions be true or not, the fish appears perfectly well formed and healthy.

4. *Fresh-water Sunfish, or Pond Perch.* (*Labrus auritus.*) With speckled sides, yellow belly, and elongated gill-covers, marked with a black and red spot.

Length about six inches; depth two and a half. Body coated firmly with semi-circular scales. Lateral line dotted, and corresponding to the curvature of the back.

Colour various; being a brown along the back, mixed with reddish, rusty, and ochreous, down the sides. Belly distinctly yellow. Ventral fins yellowish; and the pectoral and anal tinged with the same.

A black spot at the extremity of the gill-cover, tipped with scarlet.

Opening of the mouth rather narrow; of the gills moderate. Small serræ or teeth to the lips. Tongue small, and far back.

First ten dorsal rays, and three first anal, spinous.

Lives in fresh water altogether, and is taken both by the hook and seine, for pastime and food.

Rays, Br. 6. P. 14. V. 6. D. 21. A. 12. C. 17.

5. *Big Porgee of New-York.* (*Labrus versicolor.*) With changeable colours, forked tail, and large silvery eyes.

Length twelve inches, and sometimes more; depth five, and upward. Back regularly gibbous; belly evenly swelling, making him a handsome fish. Eyes large, with silvery irides, and a brow, or projection forward. Mouth moderate. Lower jaw rather shorter than the upper.

Lips plain and distinct. Within them two rows of short blunt teeth, bedded in each jaw. Palate and throat smooth. No tongue. Gill-cover tripartite and scaly, but with smooth edges. Gill-openings ample. Lateral line nearly corresponding with the curve of the back, and toward the tail inclined downward.

Tail moderately forked. Scales firmly adherent and decussating. Anal fin closes into a furrow. One dorsal fin, which also shuts into a groove along the back; it consists of twenty-six rays, the first twelve of which are spinous, and three or four also filamentous, near their tops.

The cheek, or space between the eye and upper lip, reddish, or faintly purplish. Nose, forehead, and brow pale, sub-semi-transparent, smooth, soft, and scaleless. Behind the eye, upward, a spot that is whitish, with variegations of green and blue.

Broad side, changeable with altering hues, as the position varies, of pale brown, greenish yellow, yellowish red, and reddish white, with a mixture of blue occasionally interposed. Neck and belly white. A variegated concave scale at the junction of the gill-opening with the lateral line; and a scalloped and clouded continuation of smaller scales thence to the nape of the neck. A short stiff spine, in front of the dorsal, pointing forward. An incumbent pointed scale near the origin of the ventral fin.

Rays, Br. 5. P. 15. V. 6. D. 26. A. 15. C. 17.

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6. *Little Porgee.* (*Labrus obliquus.*) With raised back, oblique bars, and concave tail.

Length eight inches; depth almost three. Has a striking similitude to the *grunts*, but is more high-backed and gibbous. Mouth small and toothless. Lower jaw received within the upper. Tail concave.

Hue whitish, with blackish shades. Fourteen narrow zones slant obliquely from the back toward the belly. Two dorsals.

Rays, Br. 7. P. 20. V. 5. D. 9—33. A. 14. C. 17.

7. *Grunts.* (*Labrus grunniens.*) With zoned sides, bearded jaw, and even tail.

Length seven inches; depth two and a quarter. Back convex, and almost gibbous. Mouth inferior and small. Lower jaw shuts within the upper; has asperities from the points of minute teeth; and after death, opens by its own elasticity.

Body whitish, and banded with three or four zones. The whitish scales alternated with dusky. Tail even. Lateral line bent upward. Two dorsal fins.

Lower jaw bearded with a dozen or more slender cirrhi, situated along the edge of the gill membrane. Throat armed with an apparatus of strong teeth, for cracking and grinding. The first anal ray short and hard; the second longer, strong and spinous.

This fish is called, by the fishermen, *young sheep's head,* and young drum, from its resemblance to those creatures. The common name is given on account of a grunting noise he is supposed sometimes to make.

Rays, Br. 7. P. 17. V. 6. D. 10—23. A. 7. C. 19.

8. *Thorn-backed Grunts.* (*Labrus spinosus.*) With a lateral line somewhat serpentine, and seven spiny processes in front of the dorsal fin, of which spines the first inclines forward, and the rest slope backward.

Length seven inches; depth full three; thickness scarcely one. Taken in the bay of New-York.

Head blunt, with the upper jaw much larger, and somewhat longer than the lower. Tail slender and deeply forked.

Colour shining white, with a bluish tinge on the back; and the back itself elevated into a sort of ridge supporting the dorsal fin. This fin consists of five, six, or seven spines, and twenty-five filamentous rays. Of the spines, the foremost points horizontally forward, and the other six slant backward; and of the filaments, the five or six are longer than the rest. Snout ends abruptly forward.

The anal fin has twenty-one soft rays, of which the three or four foremost are of greater length. Both this and the dorsal extend to the slender part of the tail. The ventral fins are four rayed, small, and almost connected together by a membrane. The caudal, anal, ventral, and pectoral fins are beautifully tinged with yellow.

The lateral line occasionally departs into small serpentine curves; and there are parallel waving or zigzag lines between the back and belly, along the broad side. The skin is free from scales, and the general figure resembles the stromat, or harvest fish.

9. *Speckled Grunts.* (*Labrus fulvo-maculatus.*) With yellowish horizontal stripes below the lateral line, and oblique ones slanting toward the back, above it.

Length five inches; depth one inch and a half. Caught in the bay of New-York.

The colour of this fish is bluish silvery, with a lateral line nearly corresponding to the convexity of the back. Above that line there are rows of yellow speckled stripes, almost parallel to each other, which run obliquely toward the dorsal fin. Below it, similar rows extend, in nearly a horizontal direction, from the gill-opening to the tail. The belly and chin are more pale and whitish than the back.

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The back rises with a considerable sweep from the upper lip, and supports a single fin, that lowers into a furrow. This fin consists of twenty-eight rays, the first twelve of which are spinous.

The gill-covers are scaly, and the cheeks marked with the ochreous streaks which distinguish the back and sides. The eyes are pale, with a dash of dark across them. Lips armed with rows, and throat with patches, of teeth.

The tail is moderately forked, or gently lunated, and consists of about eighteen rays.

The gill membrane has seven or eight rays; the ventral fins five; the anal seventeen, of which the two foremost are spinous; the pectoral seventeen. Of these the pectorals are faintly yellow; the rest pale.

10. *Pale Labrus.* (*Labrus palladus.*) With uniform pale brown sides; a dusky tinge on the posterior edge of the gill-covers; and an inky stain on the tips of the hinder dorsal and anal rays, and on the middle rays, and toward the extremity of the tail.

Length of the specimen under consideration, rather less than three inches and a half; depth one inch and a quarter, without measuring the fins. Is a deep fish, and shaped much like the pond sun-fish, or labrus auritus. Caught near New-York.

There is a remarkable uniformity in the colour of this fish. A light, or pale brown, prevails from head to tail, and from back to belly; with no other interruption than a smutty dash at the hinder margin of the gill-cover, and a dark shading at the extremities of the posterior dorsal, anal, and caudal rays.

The posterior lamina of the gill-cover is somewhat silvery. The body well coated with scales disposed in regular rows.

There is one dorsal fin consisting of twenty-one rays; the first ten of which are spinous, and the remaining eleven bristly and elongated. The anal has thirteen rays, of which the three first are spinous, and the rest elongated, to correspond with the dorsal. Caudal rather rounded, and consisting of about nineteen rays. The ventral fin has six rays, of which the first is spinous. The pectoral has ten rays, considerably lengthened, and tapering to a point. The branchial fin has five rays.

The tail is stout and broad. The mouth is moderate, and the jaws furnished with small teeth. The nostrils are double; and the lateral line curved upward to correspond with the arch of the back.

The fish has very much the habit of a perch, but has no serræ, or points on the gill plates.

SCIÆNA.

Generic character.

Head scaly. Dorsal fins two, seated in a furrow, into which they may occasionally withdraw. Gill membrane six rayed.

1. *King-fish.* (*Sciæna nebulosa.*) With cirrhous chin, clouded skin, and ragged blunt processes, partly overhanging the upper lip.

Length sixteen or eighteen inches; depth about three; though some individuals are larger. Head and body scaly. Snout projecting, rounded, soft, and smooth. Double nostrils between the eyes and snout. Two other openings, like nostrils, beneath the snout, and near the upper lip. Between these orifices, four ragged blunt processes, like imperfect cirrhi, partly overhanging the upper lip. Both lips furnished with rows of sharp little teeth. Tongue, palate, and throat toothless.

The gill membrane has six rays. Two dorsal fins, of which the foremost is furrowed. The first and second rays unite into a filament, between four and five inches long. A small short spine in front of the first ray. Tail rather lunated or concave.

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Colour of the head and body a light brown, glossed with silvery and blue; and interspersed with spots and blotches of a darker hue. Some of these clouds slant obliquely forward from the dorsal fin; some run obliquely backward from the nape of the neck; and some pass midway from the sides to the tail. There is here and there an insulated dark patch, with dirty discolourations toward the white belly.

He grows rapidly thick and stout toward the thorax; and then gently and gradually slopes away toward the tail.

There is a single cirrhus appended to the tip of the chin. Second dorsal extends almost to the tail. Fins pale brown, with whitish spots bordering on yellowish in the ventral, pectoral, and anal. Vent nearer the tail. Lateral line begins near the eye, bends gently upward, and extends to the extremity of the caudal fin.

Rays, Br. 6. V. 5. P. 19. D. 9—25. A. 10. C. 17.

2. *Black Drum.* (*Sciæna fusca.*) With orifices about the nose, cirrhi under the chin, and first dorsal fin received into a furrow.

Length, when full grown, thirty-eight or forty inches; depth, fourteen or sixteen. Spreads from the back wedgewise toward the belly, which is rather flattish and broad, rendering it easy to turn the dead fish upon the belly for examination. Mouth rather under. Lips round, thick, and fleshy. Nostrils double; and eight orifices or punctures near the end of the snout, just above the upper lip.

The black drum often equals fifteen, twenty, and even thirty, pounds. The individual now before me comes to thirty-four. I once weighed a drum that was as heavy as eighty pounds. I have been credibly informed of one that weighed a hundred and one pounds. He is taken abundantly during the summer, both with the line and net.

Head big, fleshy, and scaly. A clustered row of small teeth in the gums. Tongue broad and smooth. In the throat a singular arrangement of bones and teeth for crushing testaceous animals. The lower bone is nearly an equi-lateral triangle of two inches on each side. Two other converging bones are adapted to it above. Their surfaces are paved with teeth, which are hard, rounded at the tops, and disposed in rows as nearly as may be; and they adhere without the aid of rooted prongs.

Cirrhi to the number of twelve, and sometimes of twenty-six, under the chin and along the margin of the gill-cover. Toward the chin, five indentations or holes, large enough to receive the end of a lead pencil.

Scales of the body exceedingly large, stiff, horny, and marked by radiated and concentric lines. Their form receding somewhat from square, and approaching the figure of the letter D. They are so planted in the skin that it is difficult to remove them. Lateral line broad, rather indistinct, and running scaly to the end of the tail.

Colour a dull silvery, like the dross of melted lead, with a faint brassy, and a tinge of ruddy, though between the scales the skin is inclined to blackish on the back and sides, and thereby gives its denomination to the fish. Under the scales the silvery hue is most considerable. A black patch on the side of the older individuals behind the pectoral fin. All the fins inclined to reddish, more especially the caudal, pectoral, and dorsals. The first dorsal spinous, with a spiny stump in front of the foremost ray. The foremost anal very thick and stout, with a stump in the front of it. The first dorsal capable of being partly lowered or depressed into a furrow. Sometimes the space covered or shaded by the pectoral fin is pale or white.

Tail even. Eyes silvery yellow. Swimming bladder very thick and capacious, and a continuation of it, on each side of the thoracic vertibræ, bedded in large cells between the ribs. Large glands near the vent, internally; probably the kidneys.

His name of *drum* has been given on account of a drumming noise he makes, immediately after being taken out of water.

Rays, Br. 6. P. 18. V. 6. D. 9—21. A. 7. C. 19.

He swims in numerous shoals in the shallow bays on the south side of Long-Island, where fishermen, during the warm season, can find them almost like a flock of sheep. Is a dull sort of fish.

3. *Beardless Drum.* (*Sciana imberbis.*) Without cirrhi to the chin, with lengthened body, and with a black spot on each side of the tail.

The individual which I examined on the 5th of October, 1814, was nearly three feet in length, eight inches in depth, and nineteen in girth, and weighed sixteen pounds.

Has a row of teeth in each lip, and patches of teeth in the throat, and the general features of the drum. But is not so thick in proportion to his length. His complexion is brighter. In particular the cheeks, gill-covers, and sides round the insertion of the pectoral fins, are of a bright metallic yellowish white. The head is smooth, though with the appearance of scales. The nose has holes and processes as the drum has. Inside of the gill-covers blackish.

The chin has five holes or openings, but has not a single cirrhus.

Upon the upper part of the tail, on each side, is a black spot, about three quarters of an inch in diameter, resembling the brand of a hot iron upon wood; whence he has been called the *branded* drum.

The branchial rays are six. There are two dorsal fins, the foremost of which lowers into a furrow, and has ten spinous rays. The second has twenty-six rays. The ventral has five; the pectoral seventeen; anal ten, the first of which is stiffly spinous; the caudal seventeen. In the middle there is a continuation of scales quite to the end.

The bones supporting the gills are all furnished with patches of teeth next the throat. There are no small intestines; the space is short between the stomach and the colon, and to the latter are annexed

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seven or eight appendices. The swimming vessel is very large, and distended with air. Toward the thorax it has two vermicular processes. The gall bladder is several inches long, and very green. The teeth, in the throat are not so hard, distinct, and pavement-like, as in the black drum. Processes of the vesica natatoria are received into holes or depressions on both sides of the back-bone, among the ribs, internally; and this also occurs in the other species. On the 15th of October I measured a fine individual that was three feet and six inches long. It affords excellent eating.

4. *Red Drum.* (*Sciana gigas.*) With a ruddy or reddish complexion, and frequently weighing sixty pounds, or upward.

This is commonly considered a distinct species from the black drum; but, after much examination, I am not sure he is any thing more than a variety.

The difference is so difficult to assign, that I have heard men who pretended to be judges deliver opposite opinions on the very same parcel of fishes; one declaring them to be black drum; another affirming them to be red drum; and another again, saying that some were black, and others red.

With such doubts among the adepts, and such a coincidence of natural marks in all the individuals I have examined, there is every reason to conclude the complexion is merely the effect of age, or sex, or of some other cause operating upon the colours of fish. The rays of the fins, in a very large red drum taken alive from the water, were nearly as already enumerated for the *black drum*.

PERCA. PERCH.

Generic character.

Teeth sharp, incurvate. Gill-covers triphyllous, scaly, serrated. Dorsal fin spiny on the forepart. Scales, in most species, hard and rough.

1. *Mitchill's Perch, Striped Basse, or Rock Fish.* (*Perca Mitchilli.*) With eight parallel lines from head to tail.

One of the most large, distinguished, and excellent of the New-York fishes: may be found in the market of all sizes, from the weight of an ounce to that of seventy pounds, and upward.

The position of the ventral fins rather behind the pectoral, made me once incline to place him in the order of the abdominales. His second gill plate is finely serrated. That circumstance, if he remained among the thoracic, would rank him among the percæ. When I decided in favour of changing his order, I was obliged to constitute a new genus for him, which I called roccus. But having since found that there are fishes whose ventral fins are further back on the abdomen than this, that are, nevertheless, considered as thoracic, I have, on reconsideration, persuaded myself, it will be most correct to place him among his congeners of the perca family.

His middle gill-cover is nicely serrated, and the notches are largest at the angle. The posterior part of the third plate is armed by two spinous processes, which are partly concealed by the membrane that underlays them.

Two dorsal fins, the foremost of which is spinous, ramentose, and formed of eight rays.

Head rather elongated, and the lower jaw jutting beyond the upper.

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Tail, as it appears to the eye in its contracted state, furcated; when expanded, lunated.

Upper lip and lower jaw furnished with minute and file-like teeth; the throat armed with patches of the same.

But one of the most obvious and distinguishing features of this fish, is the striped appearance of his body. From head to tail, his back and sides are marked by longitudinal lines. The ground colour is pale brown, whitish, or silvery. On this are delineated the aforesaid lines in parallel rows. These rows, at some seasons, appear black, and make a strong contrast. At other times they are more faint, and seem to be faded into a reddish brown. When the brown thus predominates, dark specks or spots can be traced at regular distances along the stripes, particularly toward the back.

The number of these stripes is usually eight; and four of them most commonly reach the tail. The rest are frequently shorter; vanishing unequally in their progress.

Belly a fine mixture of silvery and white. Scales adhere firmly.

Tongue distinct, with roughness at its root and near its edges.

Lateral line straight, and when the colours are deep, not very apparent; but when they are more faint and faded, perceptible enough as it runs through and along the fourth or fifth stripe, and may be traced almost to the end of the caudal fin.

Eyes white. Mouth capacious. Gill-openings ample. Three first anal rays spinous.

Rays, Br. 7. P. 16. V. 6. D. 8—14. A. 15. C. 17.

This fish is very highly and justly prized by the New-Yorkers. He is savoury and excellent beyond the generality of fishes. His common abode is the salt water; but he migrates to the fresh streams and recesses to breed during the spring, and for shelter in winter.

He takes the hook, especially when baited with soft crab, greedily.

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Small ones are catched by the boys, from the wharves, and boats, everywhere near the city.

Their greatest run is late in the fall. Instead of going away on the approach of winter, the striped basse seeks refuge in bays, ponds, and recesses, where he may remain warm and quiet. Here the fishermen find him, and make great hauls during the coldest season, when very great numbers are brought to market in a frozen state. At this time it is usual to take some of the very large and heavy ones. Yet I have seen a dozen at a time of the weight of fifty pounds each, in the New-York market, early in October, while the weather was very mild.

He is also taken in seines during the summer, and in autumn. Indeed, there is no fish that stays more steadily with us, all the year round, than the rock; and he is found of all sizes, to suit all sorts of palates.

(a) *P. M. interrupta.* There is a variety of this fish, which consists chiefly in an irregularity of the side-lines. For here their parallelism is broken; and their integrant parts, the specks, and spots, resemble confused rows of printing types. I have seen this interruption among the stripes, between the gill-opening and dorsal fin. It also occurs among the rows below the lateral line, about the middle of the body; and occasionally in other parts.

(b) *P. M. alternata.* There is, in some individuals of this species, a further variety. This consists of a row of dots or spots, longitudinally, between each of the stripes, or lines; making alternate courses of spots and lines. This diversity occurs most commonly in the larger fish, and may be natural to them, though I have considered it as a variety, and do now note it so.

2. *Sea Basse.* (*Perca varia.*) With undivided tail, and speckled sides and fins.

Length fourteen inches; depth almost three. Weighs, when large,

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from two to three pounds. Mouth wide, with free branchial openings. Both jaws are furnished with short and sharp teeth. Lower jaw rather projects. Tongue white and smooth.

Back considerably arched, and approaching to gibbous, especially in the male fish. The females have less of a bunch, but a more prominent belly. Body protected by firm, stout scales.

Colour speckled with black and white regularly from head to tail, the black predominating toward the back, and the white toward the belly. The dorsal, anal, and pectoral fins partake of the speckled or chequered appearance. Ventrals and caudal do not show the variegations so strongly. Is, when first taken, frequently tinged with green about the back and root of the dorsal fin; and a purple suffusion is not unfrequent.

From a point a little forward of the dorsal fin, a gradual slope to the nose. He is deep through from the bunch to the sternum; but becomes much more slender toward the tail. Upper gill-cover serrated. Lateral line corresponds with the back. The first ten dorsal rays spinous. Vent midway. Tail undivided. *Black harry, hannahills*, and *blue-fish*, are some of the names by which he is known.

Rays, Br. 7. P. 18. V. 6. D. 21. A. 11. C. 17.

Abundant in New-York, and is one of the most savoury fish at market. Taken most plentifully near Sandy-Hook, in the ocean; and even at the wharves of the city.

BODIANUS.

Generic character.

Habit of the genus perca. Gill-covers scaly, serrated, and aculeated. Scales, in most species, smooth.

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1. *Silvery Perch.* (*Bodianus argyro-leucos.*) With white and silvery scales, and lateral line reaching to the end of the tail.

Eight inches long, and three deep. Gill-cover tripartite, with two or three spines, and many serræ on the edge of the middle plate. Back elevated, and belly prominent, so as to give him a plump appearance. Tail even. Head and jaws somewhat sloping, and faintly approaching a rostrated figure.

Mouth ample. Tongue conspicuous and smooth. Lips furnished with minute and sharp teeth, but none in the palate, tongue, or throat. Eyes rather large, and yellowish white. The whole complexion whitish. The white of the back relieved by pale brown scales, disposed in rows ascending toward the back, and thence inclining toward the tail.

Lateral line rather arched by running to the extremity of the tail. First ventral ray sharply spinous. All the first dorsal rays, and the two first rays of the second fin, spinous. Below the line, the sides and belly are alternated with shades of a silver white, and a milk white disposed into spaces and rows.

Ventral and anal fins yellow. Pectoral, caudal, and second dorsal, yellowish.

Rays, Br. 7. P. 15. V. 6. D. 11—12. C. 17.

2. *Middle Grunts.* (*Bodianus costatus.*) With cirrhous and cryptous lower jaw, green-spotted gill-cover, and sides covered with ribclouded specks.

Length eight inches and a half; depth two and a half. Head roundish and scaly. Middle plate of the tripartite gill-cover, both serrated and aculeated.

Lateral line runs to the extremity of the tail. Two dorsal fins, neither of which is properly spinous; and the first infringes upon the second. Mouth under, and gaping after death. Teeth, in the throat, above and below.

Colour pale brown on the back, with silvery sides, and white belly; variegated with hues of yellowish, blue, and green.

A dozen or more narrow faint clouds slant down the sides, looking almost like ribs. Five holes under the chin, among half a dozen very delicate cirrhi.

A greenish spot in the middle of the posterior gill plate. A dark spot at the origin of the pectoral fin. Ventral and anal fins yellowish. Has the ragged cirrhous appendage to the upper lip which the kingfish possesses; and also the two orifices near them. Has, indeed, very much the habit of the kingfish. Two first anal rays spinous; one short, the other long.

Rays, Br. 7. P. 17. V. 6. D. 10—29. A. 10. C. 17.

3. *Triple-tailed Perch.* (*Bodianus triourus.*) A fish brought, though not commonly, to the New-York market.

The specimen which I procured on the 23d of July, 1814, measured thirteen inches and a half in length, five in depth, not including the dorsal fin, and about one and a half in thickness. He is reported to grow much larger, so as even to weigh four or five pounds. The one before me was taken in a seine, on the Jersey shore, near Powles-Hook. He weighed twenty-seven ounces.

Snout rather elongated. A knob, or gibbosity in front of the dorsal fin. Eyes rather small, and of a purple or amethystine colour.

The tail is convex or rounded. The posterior rays of the dorsal and anal fins are so much lengthened and expanded, as to resemble caudal fins, and to give the fish somewhat of an appearance of three tails.

Gill-cover tripartite, and scaly. The posterior edge of the foremost lamina, strongly aculeated, and almost spinous. A bony plate, with a serrated edge behind the gill-opening. Another with a similar edge above the gill-opening.

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Lips distinct. Mouth moderate. Lower jaw rather jutting, and acutely toothed. Upper jaw also armed with a row of sharp teeth. Tongue broad, and smooth, with clouded edges. A dark membrane of a semi-lunar form inside of the mouth, immediately within the teeth of the lower jaw. Near the extremity of this latter, four bronzy spots.

Lateral line bends upward, somewhat irregularly at first, and then proceeds with an easy slope to the tail. Scales form a firm coating.

The first eleven rays of the dorsal fin are spinous, and rather ramentose. The first three anals are also spinous; and so likewise is the first ray of the ventral. This latter is stout and strong, while the pectoral fin looks delicate and weak.

The colour of the back and sides is a rusty black; of the belly, a dirty clay, variegated with blackish and yellowish specks. A dull yellow is very distinguishable behind the eyes, above the gill-covers, along the insertion of the dorsal fin, the commencement of the lateral line, and under the pectoral fins. The dorsal, anal, and ventral fins are a little tinctured with yellowish, amid the inky suffusion. The pectoral fin is pale and semi-transparent, appearing very faintly yellow, when viewed by itself; but when lying close to the side, showing the yellow scales through it. The whitest part of the fish is immediately beneath the pectoral fin. Some of the fishermen call him *black grunts.*

Rays, Br. 6. P. 15. V. 6. D. 27. A. 13. C. 16.

4. *Pigmy Perch.* (*Bodianus exiguus.*) A very small species, taken among the shrimp, and scarcely larger than the most minute stickle-back.

Length one inch; depth one eighth of an inch.

For a fish of his size, the head and eyes are rather above proportion. The gill-covers are ample, and their openings wide.

The foremost gill plate is serrated and aculeated. Excepting the abdominal region, the body is generally semi-transparent, so that the vertebræ may be distinguished.

Mouth capacious, and inclined upward.

Two dorsal fins, the foremost of which is composed of stiffer rays than the hinder. The first anal ray is spinous.

If he is the young of some species, I am unable to determine what that species is.

Rays, Br. 4. P. 7. V. 7. D. 7—18. A. 10. C. 17.

5. *White Perch.* (*Bodianus pallidus.*) With soft and connected dorsal fins, pale back, and white sides.

Length eight inches; depth two and a half. Colour whitish, with a dark hue according to the angle of reflected light. Back pale. Belly silvery. Tail even. Lateral line extending through it.

Small teeth in the lips. Patches of them in the throat. Eyes large and pale. Nostrils double. Four or five holes under the chin, but no cirrhi.

Middle gill plate both jagged and thorny.

Head scaly. In some aspects the scales appear in the form of spotted rows, neither striped nor zoned. One short and one long spine to the anal fin. Ventrals and anal yellowish. Dorsals two, running into each other, and the foremost scarcely spinous.

Rays, Br. 6. P. 14. V. 6. D. 9—23. A. 12. C. 19.

6. *Red Perch.* (*Bodianus rufus.*) With three anal spines, first dorsal fin spinous and ramentose, and ruddy ventral and anal fins.

Length ten inches; depth three and a half; thickness about two; making him a thick and rather gibbous fish. I have seen them fourteen inches long, and near five deep, brought from Quag on Long-Island.

Middle gill-cover both serrated and moderately aculeated below. Head scaly, and rather elongated.

Jaws and throat armed with small teeth. Mouth and throat wide. Tail forked, or rather lunated. Body whitish, and speckled with rows of a kind of cream-colour and rusty brown. Lower fins and throat

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ruddy. When the fish is not in the breeding season, the colours are browner and darker; leading the people to call him the *black perch*.

Scales hard and strong. Lateral line rather crooked upward, and very plain. Three foremost of the anal fins spinous. First dorsal fin spinous and ramentose. Is one of our most firm and savoury fish.

Rays, Br. 6. P. 15. V. 5. D. 9—13. A. 14. C. 17.

7. *Yellow Perch.* (*Bodianus flavescens.*) With serrated bones on the thorax, scarlet ventral and anal fins, and brownish zones on the sides.

A beautiful fresh-water fish, of a foot or more in length, and three inches in depth.

Head rather small, and tapering toward the snout. Both jaws roughened with very small teeth. Eyes large and yellowish.

Body deep and thick, but becoming slender toward the tail. Scales rather hard and rough. Lateral line almost straight. Tail rather concave. First ventral ray spinous; as are also the two first anal rays, all the rays of the foremost dorsal fin, and the first of the second dorsal.

Colours brown or olive on the back, turning to yellow on the sides, and white on the belly. Faint brown zones to the number of four or more diversifying the sides from back to belly. Dorsal and pectoral fins brown. Ventral and anal scarlet.

Gill-covers tripartite. Lower and hinder edges of the foremost acutely serrated. Middle one serrated at the lower edge, and streaked radially on the broad side. One serrated bone on the thorax immediately above the pectoral fin, at the posterior margin of the branchial opening; and two other bones with serrated edges above the first, near the upper part of the branchial opening.

In the year 1790, I transported about three dozens of these yellow perch from Rockankama pond, in Suffolk county, to Success Pond, in Queens. The distance is about forty miles. Before that time Success Pond contained no yellow perch. Since that time, there have been as many of them as could subsist. My assistant in this undertaking was my uncle, Uriah Mitchill, Esq. high sheriff of Queens county. We filled a very large churn with the water of Rockankama pond. We put so few perch into it that there was no necessity for changing it on the road. We were in a wagon, and came the whole distance on a walk, without stopping to refresh either man or horse. The project of transporting the fish to Success Pond was completely answered; and in this way was the yellow perch carried to the Hempstead waters. (*See Medical Repository, vol.* 3. *p.* 422.)

Rays, P. 14. V. 5. D. 12—14. A. 10. C. 19.

SCOMBER. MACKEREL.

Generic character.

Body oblong, smooth, sometimes carinated by the lateral line. Small or spurious fins, (finlets,) in most species, above and below, toward the tail.

1. *Thimble eyed, bull eyed, or chub mackerel.* (*Scomber grex.*)

Length about ten inches. Body round and tapering away. Lateral line crooked. Back marked with meandering lines of pale and dark green.

Colour, near the lateral line, of a somewhat lighter green and less mottled. The rest of the surface, a pigeon's-neck hue, variegated and changeable like one of copper.

Five finlets above, and as many below. First anal ray spinous. Comes occasionally in prodigious numbers to the coast of New-York, in autumn. This was memorably the case in 1781 and 1813, when the bays, creeks, and coves were literally alive with them, and the markets full of them.

Rays, Br. 5. P. 19. D. 9—12. A. 13. C. 23.

2. *Spring Mackerel.* (*Scomber vernalis.*) With longitudinal spurious fins on the sides of the tail, and smutty patches near the pectoral and ventral fins.

A very elegant fish, of sixteen or seventeen inches long, and three deep. Form round and tapering. Back marked by deep blue parallel curved transverse bands, reaching below the lateral lines on each side. The intervening spaces are of a paler blue and reddish brown. Head bluish, with dark spots and marks. Shades of green intermixed. Belly silvery white and iridescent. Hues beautifully changeable. Tail deeply forked, or almost lunated; and branching so wide that it measures four inches across from the upper to the lower extremity of the caudal fin. A spine before the first anal ray.

The strongest rays proceed from the superior and inferior sides of the tail, and not from the middle. Between the insertions of the caudal rays, on each side of the tail, are two longitudinal spurious fins, half an inch in continuance, with small scales in the interjacent spaces.

Five finlets on the tail above and below. A smutty patch frequently on the upper parts of the ventral fins; and the like behind the pectorals.

A smoke-coloured streak or cloud obscuring the brilliancy of the sides between the pectoral fin and the tail.

Eyes large, with a transparent nictitating cover. Lower jaw serrated.

Lateral line corresponds with the back, and is not scaly; though it may be distinguished and traced by the finger.

Is caught off Sandy-Hook in great numbers with the hook, and brought in abundance to the New-York market.

Rays, Br. 6. P. 17. V. 5. D. 10—11. A. 12. C. 20.

3. *Horse Mackerel.* (*Scomber plumbeus.*) With approximated ventral fins, uniform leaden colour, variegated with greenish, and no finlets.

A well-formed fish of about thirteen inches long, when grown, and three inches deep; weight nearly a pound, or about fourteen ounces.

Mouth large. Gape wide. Lower jaw jutting beyond the upper, and yet the lower teeth shutting within the upper. When the jaws are closed, the upper teeth lap over the margin of the lower jaw. Eyes large and yellowish white.

Gill-covers smooth. Openings ample. Tail deeply forked. No finlets or spurious fins. Colour of the head and body such that they often call him *blue-fish;* it being of an ash, leaden, or dove, verging toward white about the neck and belly, and interspersed faintly with red or carnation. On the head and back shades of green, and sometimes of blue, by nice inspection.

Jaws sharply toothed. Palate roughened with a patch of small teeth on each side. Tongue smooth. A plenty of small and delicate scales on the skin. Inky spots sometimes behind the pectoral fins, or rather at their insertions. Two dorsal fins, whereof the first is faintly spinous, and sinks into a furrow.

Lateral line curved gently upward, and a longitudinal indentation often perceptible below it. Ventral fins approximated at their base.

Rays, Br. 7. P. 17. V. 6. D. 7—26. A. 26. C. 19.

Is one of our most savoury fish; and the young ones are taken plentifully with the hook at our wharves, by the boys, in August.

4. *Pilot Fish.* (*Scomber ductor.*) With silvery blue skin, diversified by four transverse blue bands, four dorsal spines, and tail barred with black.

The companion of the shark, and well known already.

5. *Yellow Mackerel.* (*Scomber crysos.*)

Length six inches and a half; depth two. A neat, compact, hand-

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fish, about three quarters of an inch thick. He is plump and smooth generally. Back forms a neat regular curve. Belly an apposite corresponding sweep. Head neither rostrated nor blunt. Tail very slender, and ending in a fin deeply forked. A marine fish, taken in the bay of New-York.

Lateral line bends upward about the thorax; then turns downward and runs straight to the middle of the tail. Soon after its curvature it becomes mailed and spinous. The spines are short, and directed backward. They are sharper and larger, and their bases wider as they approach the tail. Thus the line itself widens in its course backward.

Mouth moderate. Lower jaw rather thin and small. Teeth minute, and may be said to be rather adapted to hold fast than to bite. Eyes yellow, and rather large. A black spot frequently at the edge of the gill-cover.

Two dorsal fins, the foremost of which is spinous, and occupies but little space. In front of it, a spine pointing forward. The hinder dorsal filamentous, and continued almost to the tail. Two spines just behind the vent, and from them the ventral fin extends also almost to the caudal. A bony ridge reaching from the upper part of the nose to the first spine of the back.

Pectoral fins pointed; ventrals small.

Colour of the back greenish blue, with a yellow suffusion. Yellow gilds the gill-covers, sides, and belly. The same golden hue also tinges the second dorsal, caudal, anal, pectoral, and ventral fins, in varying shades. The chin and gill-covers are whitened a little, and white likewise appears a little along the belly. Tongue yellow, and rather rough.

Scales few, and easily deciduous. No zones, stripes, or spots anywhere about him; nor any spurious fins. But a sort of second lateral line near the roots of the dorsal fins, on each side of the back.

Rays, Br. 7. D. 8—24. A. 19. P. 18. V. 4. C. 18.

6. *Spanish Mackerel.* (*Scomber maculatus.*)

Length nineteen inches; depth three and a half; thickness rather more than two. Girth about eight; so that a section of his body is elliptical. Weight twenty-seven ounces. A fine and beautiful fish. Comes in July.

Snout pointed. Gape wide. Jaws close accurately, but in such a manner that the lower is bigger, and seems longer, than the upper. The former is rather blunt, while the latter is sharper.

Tail spreads into a broad fork, or widens almost to a crescent, which is so large that the extremities of the caudal fin are six inches apart.

Margin of the enormous mouth armed with distinct and cuspidated teeth; excepting the front of both jaws, where they are scarcely perceptible, or are quite wanting.

Tongue small. Gill-openings ample. Eyes large and yellowish bright. Nostrils near them forward, and double.

Ridge of the back from head to tail greenish. Rest of the back leaden or dove-coloured. Chin, neck, gill-covers, sides, and belly, a resplendent white. Ventral, anal, and spurious lower fins, exhibit a whiteness scarcely less brilliant.

About twenty yellowish spots, some of them a quarter of an inch in diameter, decorate the sides, and impart to them a gay appearance. They are distributed about without any regard to rows.

Lateral line contrasts with the continuous skin, by being scaly. Commences above the gill-opening, and at first rises a little. Then it descends through and among the spots, touching occasionally some of them, and dividing others. It does not travel straight, but crooks and meanders along prettily toward the tail.

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Eight finlets above, and as many below. Two dorsal fins, with a small spine between them.

The forepart of the first dorsal, making more than half of it, is black; the remainder white.

Second dorsal fin and finlets, and caudal, brown.

Pectoral fin acuminated; and brown on the outside, and black within.

A spurious finlet in the course of the lateral line, and near its posterior extremity. Two others somewhat curved, between the former and the caudal fin; one above and the other below. Skin near them greenish.

Ventral fins small, and a kind of spurious fin between them.

Rays, Br. 5. V. 4. P. 20. D. 17—16. A. 18. C. 24.

7. *Banded Mackerel.* (*Scomber zonatus.*) With brown bands down the sides, and white tips to the fins.

Taken in the bay of New-York, occasionally, during the warm season. One that was taken at a city wharf, on the 26th of August, 1814, was seven inches and a half long, rather more than two deep, and somewhat above one in thickness. I have known one of nine inches long, that weighed rather more than half a pound.

Colour of the back an elegant greenish blue; sides paler; belly almost white. Perpendicular brown bands on the sides, to the number, usually, of six, from a quarter to half an inch wide. The foremost includes the pectoral fins. Body covered with very small scales.

From the eyes runs a crescent, reaching almost to the foremost dorsal fin.

Tail deeply forked and yellow; the upper and lower extremities neatly tipped with white. Anal rays yellowish, and their extremities fringed prettily with white. Dorsals brown, and the summits of the foremost four or five rays of the second dorsal fin likewise whitened.

Has two dorsal fins, the foremost of which is feebly spinous. The anal and second dorsal are entire, and without finlets. The general form and aspect are those of the scomber plumbeus. Yet the lower jaw is shorter than the upper, and shuts within it. Both jaws are furnished with sharp but minute teeth. Through the middle of the tongue runs a longitudinal toothed stripe.

Eyes moderate and yellowish. Skin smooth and scaleless. Lateral line plain to be seen, but not very evident to the touch, until it approaches the tail. After bending upward at the thorax, it runs almost straight to the tail, where it makes a slightly projecting lamina. Ventral fins large. Their rays, especially the inner ones, much branched. Their upper sides black; the lower white, with a shade of yellow.

Rays, Br. 6. P. 22. V. 5. D. 7—37. A. 22. C. 23.

These marks are most evident in the younger fish. When they are older, they are not so distinct. In the full-grown individual, the brown bands of the sides, and the white tips of the fins, are more faint; but they are highly beautiful in a small fish of the species, swimming in his element.

In some there is a yellowish stripe or riband running straight from the upper part of the gill-opening backward. The lateral line, in the old fish, is sensibly raised toward the tail. In these the yellowish colour is less distinct in the fins; and the crescent over the head is more faint. There is often an appearance of a large membrane behind the front teeth, in the upper jaw.

8. *Bonetta.* (*Scomber sarda.*) With a patch of minute scales reaching from the back of the neck to the thorax behind the pectoral fin; a leaden complexion; cloudy streaks extending obliquely toward the back; and dusky zones descending directly toward the belly.

Length of the specimen before me twelve inches; depth two and three quarters; girth almost six. The figure of the fish being cylindrically round, like many other sorts of mackerel, but tapering away toward the head and tail.

The belly is ash coloured, the back dove or lead coloured. From the sides, six or seven darker lines, about an eighth of an inch broad, slope upward to the back, and about ten or a dozen bands nearly half an inch broad, of a fainter hue, diversify the sides transversely from head to tail.

The jaws are almost even; though, correctly speaking, the lower is rather shorter, and shuts fairly within the upper. The teeth are sharp and distinct. There is a single row of them on each side of the palate extending toward the throat, which Dr. Bloch mentions as a great peculiarity.

The skin generally is smooth and silky; but patches of minute scales are found between the nape of the neck and the rear of the pectoral fins; and sometimes at the pectoral and caudal.

There are eight spurious fins on the upper side of the tail, and seven below. There are two dorsal fins, of which the foremost has twenty rays, and the hindmost fourteen. The tail is forked, or almost lunated, with three longitudinal fin-like excrescences on each side.

The eyes are large, and the irides yellowish. The nostrils are double, and the openings a quarter of an inch apart. The holes nearest the nose are round and small; those next the eyes resemble long and narrow vertical slits.

The lateral line waves prettily along in its course. The leaden colour is most distinct on the head and gill-covers.

The pectoral fin is rather short, and contains twenty-four rays; the ventral smaller, and has six; the anal fourteen; and the caudal twenty-four, with some imperfect ones.

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GASTEROSTEUS. STICKLEBACK.

Generic character.

Body somewhat lengthened. Dorsal spines distinct. Ventral fins spiny. Abdomen carinated, or shielded on the sides, and bony beneath.

1. *Two-spined Stickleback.* (*Gasterosteus biaculeatus.*) With two spines in front of the dorsal fin.

The smallest of our fishes, scarcely more than an inch in length; and known by the two thorny processes on the back, forward of the dorsal fin. Seems to be the species described by Shaw; and, what is remarkable, the only one that I remember for which he has given credit to the waters of New-York. Caught in the salt water among the killifishes.

2. *Four-spined Stickleback.* (*Gasterosteus quadracus.*) With four spines in front of the dorsal fin.

In front of the dorsal fin four spinous processes irregularly situated. Two similar spines in lieu of ventral fins. Connected with these on each side a lateral spine reaching almost as far back as the vent. The three foremost of the dorsal spines stiff; and the hinder one moveable. Found, like the preceding, in the salt water among the killifishes.

Rays, Br. 3. P. 13. D. 12. A. 11. C. 13.

TRIGLA. GURNARD.

Generic character.

Head large, mailed, and marked by rough lines. Gill-covers spiny. Gill membrane seven rayed. Finger-shaped processes, in most species, near the pectoral fins.

1. *Gurnard, or Sea Robin.* (*Trigla lineata.*) With a line from head to tail along and below the lateral line.

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Length eighteen inches. Head broad and squarish. Four spinous processes on the head-piece; two at the eyebrows, and two others at some distance behind the eyes. A spine on each side of the thorax above the pectoral fin. The rough gill-covers have each two strong spines, directed backward, one on the middle, and the other on the hinder plate. Beside these ten points, there are several other projections, not quite amounting to spines.

Eyes vertical, and yellowish white. Two dorsal fins, the foremost of which is spinous, and sinks into a furrow. Three of its rays serrated. Body beset with small adhesive scales, and tapering away toward the tail.

Colour of the head, back, and sides, dirty brown of different shades, darker above, and lighter beneath. Belly cream coloured, with reddish tinges, and rusty marks. Lateral line strongly distinguishable by its prominency and higher colour. Below it a coloured stripe more inclined to reddish, and, as it approaches the tail, interrupted so as to form a row of spots. Skin near them suffused with ruddy. Some rusty spots between the two lines. Between the lower line and the belly a course of brown and reddish spots.

Three digitated processes in front of each pectoral fin. Pectorals large and long, reaching two thirds of the distance to the tail, with dark brown and reddish narrow lines across.

First dorsal has an irregular inky patch. Anal fin reddish, with a brown spot at the insertion of each ray. Caudal reddish.

Rays, Br. 7. P. 13. V. 6. D. 9—12. A. 12. C. 17.

2. *Web-fingered Gurnard.* (*Trigla palmipes.*) With bright yellow fringes on the fingers.

Length eighteen inches, and more. Head mailed and rough, even to the rim of the jaws. Middle plate of the gill-cover has a strong spine pointing backward. Posterior plate divided behind into two sharp prongs. A soft layer and rim of skin behind them. A broad scale on each side of the thorax, ending in a thorny process. A hard scale extending backward from each eye, and ending rather bluntly between the gill-opening and foremost dorsal fin.

Back brown, interspersed with ochreous, reddish, and yellowish. Lateral line rough, and strongly marked at its commencement near the nape of the neck, and becoming more faint as it proceeds, until it is rather indistinct near the tail. Belly, from the neck to the vent, white; and remarkably so behind the fingers and fins. Behind the vent colour whitish, with shades of yellowish and reddish.

Two dorsal fins, the first of which is spinous, and lodged in a groove,

Three bright yellow fingers on each side from one and a half to two and a quarter inches long, curved, expanded, and webbed toward their extremities.

Pectoral fins four inches long, and scolloped between the points of the rays. They are of a roundish shape. Their outside irregularly purplish brown and yellow. Their inside faintly bluish with dusky. White above, as far as the third ray. Ventrals white, with yellowish rays on the upper side. Dorsals brown, with intermixture of yellow. Tail darker, especially at the extremity, with stripes of yellowish between the rays. Anal dirty yellow. Scales moderate, and firmly adherent.

Rays, Br. 6. P. 14. V. 6. D. 9—14. A. 16. C. 15.

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Order, ABDOMINALES.

SILURUS. CATFISH.

Generic character.

Head large, depressed. Mouth wide, bearded by long tentacula. Body lengthened, naked. First of the pectoral fins, or of the first dorsal fin, toothed backward.

1. *Common fresh-water Catfish.* (*Silurus catus.*) With the hinder dorsal fin adipose, twenty rays in the anal fin, and eight beards.

Has eight cirrhi: two large ones from his mouth like whiskers, two on the upper jaw above and behind them, and four depending from the chin.

Head and body mucous, without scales. First rays of the pectoral fins spinous, with a reversed serrated edge behind. Two bony spines connected with them, and projecting backward, so as to show their points on each side of the body at the skin.

First ray of the first dorsal fin spinous. Second dorsal fleshy. Anal fin has twenty rays.

Rays, Br. 7. P. 8. V. 8. D. 7.—2d fleshy. A. 20. C. 21.

2. *Salt-water Catfish.* (*Silurus marinus.*)

A splendid fish, twenty inches long; four inches deep; and three and a half wide. Taken June 30th, 1814.

Two whiskers, between five and six inches long, projecting from the upper lip, near the corners of the mouth.

Two cirrhi, near one inch and a half long, depending from the chin.

A bony ray in front of the first dorsal fin two inches and a half long; a cartilage spliced to it, as it were, and continued two and a half inches longer, making together a dorsal projection five inches long.

First rays of each pectoral fin bony, with reversed spines behind, and about three inches long; from which a cartilage is continued about three inches; making together six inches.

Both the dorsal and pectoral bony rays are notched in front, but not serrated enough to hold fast or to scratch.

The several cartilaginous continuations are smooth on the anterior part; but have the appearance of serræ on the posterior edge. Yet these serræ are invested in a membrane which shelters them from the touch.

Two dorsal fins, the foremost of which is pretty far forward, and consists of eight rays. The hindmost pretty far back, and adipose without rays. The distance between them six inches.

Tail deeply forked; the extreme rays somewhat converging; but nevertheless the distance between them exceeds four inches.

Skin has a silky softness. Back glossy blue, with clouds and shades of green. Lateral line almost straight. Below that the colour a silky white, down to the belly, which is a milk white. Is an exquisite fish for eating.

Ventral fins far back. They are inclined somewhat to red. Dorsal and pectoral fins have more of the ruddy; and the anal and caudal most of all.

Rays, Br. 4. P. 13. D. 8.—2d fleshy. V. 6. A. 22. C. 19.

SALMO. SALMON.

Generic character.

Head smooth, compressed. Tongue cartilaginous. Teeth both in the jaws and on the tongue. Gill membrane from four to ten rayed. Body compressed, furnished at the hind part with an adipose fin.

1. *Common Salmon.* (*Salmo salar.*) Of a silvery gray colour, with spots, and in the male, incurvated jaws.

Has been taken, since the discovery, a few times in the Hudson. But here he is a straggling fish, and not in his regular home. There is no steady migration of salmon to this river. Though pains has been taken to cherish the breed, salmon has never frequented the Hudson in any other manner than as a stray. The supply to the New-York market usually came from Connecticut river; but since dams and impediments have kept the salmon away from their customary places of resort in that stream, they have been brought from the Kennebec, covered in ice. Their season is the middle of May, or beginning of June.

2. *Smelt.* (*Salmo eperlanus.*) Bluish silvery salmon, with transparent head, and seventeen rays in the anal fin.

This fish is occasionally brought to the New-York market; but he is not a steady visiter. I have eaten him in fine style at Newark, whither he was brought from the Passaic river.

3. *Common Trout.* (*Salmo fontinalis.*) With yellow and red spots on both sides of the lateral line, concave tail, and sides of the belly orange red.

Back mottled pale and brown. Sides dark brown, with yellow and red spots; the yellow larger than the red, and surrounding them. The latter appear like scarlet dots. Lateral line straight. The yellow spots and red dots both above and below that line. Sides of the belly orange red. Lowest part of the abdomen whitish, with a smutty tinge. First rays of the pectoral, ventral, and anal fins white, the second black, the rest purplish red. Dorsal fin mottled of yellowish and black.

Tail rather concave, but not amounting to a fork; and of a reddish purple, with blackish spots above and below.

Eyes large and pale. Mouth wide. Teeth sharp. Tongue distinct. Skin scaleless.

Is reckoned a most dainty fish. They travel away to Hempstead and Islip, for the pleasure of catching and eating him. He is bought at the extravagant price of a quarter of a dollar for a single fish not more than ten or twelve inches long. He lives in running waters only, and not in stagnant ponds; and, therefore, the lively streams, descending north and south from their sources on Long-Island, exactly suit the constitution of this fish. The heaviest Long-Island trout that I have heard of, weighed four pounds and a half.

Rays, Br. 10. P. 12. V. 7. D. 13 and 0. A. 11. C. 23.

I copy the following article from the news-papers:

"Mr. Robbins, of the Philadelphia theatre, visited Long-Island (New-York State) in the summer of 1814; during his stay in that place, he caught *one hundred and ninety fresh-water trout*, weighing as follows, viz.

		Trout.		*lbs.*	*oz.*
Sept. 6th,	caught at Nichols'	14	weighing	——	
8th,	at Patchoque,	9		7	8
9th,	do.	21		10	8
10th,	do.	78		26	0
12th,	do.	5		5	0
13th,	do.	4		5	8
15th,	at Fireplace,	1		3	0
16th,	do.	16		16	8
17th,	do.	9		3	0
19th,	at Patchoque,	23		47	0
20th,	do.	6		7	8
21st,	do.	4		8	3
Days 12		Fish 190		lbs. 139	11

"The largest fish caught at Patchoque, weighed two pounds and eight ounces; and the largest at Fireplace, three pounds.

"Dr. Post, of New-York, caught one hundred and fifty trout, weighing one hundred and five pounds, in the month of April, 1814, in the waters of Long-Island.

"Mr. Purvis, of New-York, caught a trout weighing four pounds eight ounces, measuring twenty-four inches in length. A drawing of this fish remains at Fireplace, near where it was caught."

FISTULARIA. PIPE-FISH.

Generic character.

Snout cylindric. Mouth terminal. Body lengthened. Gill membrane seven rayed.

1. *New-York Trumpet Fish.* (*Fistularia neo-eboracencis.*) With lower jaw jutting beyond the upper, with approximated eye orbits, and with the lateral lines almost touching the ridge of the back, a little behind the pectoral fins.

The specimen now before me is fourteen inches long, and very slender. Of these the snout measures more than two inches and a half; and a slender cartilaginous or horny continuation of the tail, about four inches.

The mouth is terminal, with a projecting lower jaw. The rostrum is grooved or fluted on the sides. Eyes large, orange coloured, and vertical. Their orbits very near to each other.

Body soft, smooth, and scaleless, with somewhat of semi-transparency. Shape roundish, and of that form (plagioplateus) whose transverse diameter is greater than the perpendicular. Colour brown on the back; with a dotted lateral line, and a row of pale spots on each side. Belly white in the middle, and semi-diaphanous on the right and left. Though the gill-openings are ordinarily closed, they, on examination, are wide and capacious enough.

The abdominal fins are small, and wide apart. The dorsal and anal fins are far back and opposite, like those of the pike. The tail is forked, and from its middle proceeds a single ray, of a black hue, four inches long, filamentous like whale bone, or capillary like horse hair. The orbits of the eyes are beset with angular processes. The pectoral fins are inserted at the thinnest part of the body, and are themselves broad and pretty large. There is a radiated patch on the gill-cover almost resembling a pectoral fin.

The lateral lines are very peculiar in this respect, that, arising from points somewhat forward of the upper gill-openings, they almost touch the dorsal ridge by finely approaching curves, and then recede to the usual distance on their respective sides.

The fins generally, but more especially the dorsal, anal, and caudal, have a pale and whitish appearance.

2. *Indian Trumpet Fish.* (*Fistularia chinensis.*) With scaly yellowish red skin, longitudinal rows of black spots, and simple rounded tail.

The specimen before me is about eighteen inches long, and was brought by a ship-master from New-Holland.

The appearance of the skin puts me in mind of the texture of a raw-silk stocking. Colour of a yellowish brown, with a ruddy tinge. On each side of the back two close rows, and one more remote, of blackish spots running lengthwise. Another row along the middle of the belly. Several pale or whitish stripes along the sides. Snout about four inches long, with a semi-transparent appearance, and mouth near the end. The creature is described by Shaw, in his General Zoölogy, vol. 5. part 1. p. 97, 98.

ESOX. PIKE.

Generic character.

Head somewhat flattened above. Mouth, in most species, wide. Teeth, generally, sharp in the jaws, palate, and tongue. Body lengthened. Dorsal and anal fin, usually, placed near the tail, and opposite to each other.

1. *New-York Gudgeon.* (***Esox flavulus.***) **With stripes lengthwise on the body, and transverse ones on the tail.**

A pretty little fish, of five or six inches long, and an inch and a quarter deep.

Head and neck somewhat flat. Back broad. Figure chubby. Mouth small and scarcely toothed. Lower jaw longer and broader than the upper. Tongue distinct. Gill-covers large, and openings ample.

Colour of the back a yellowish brown; sides pale yellow; belly yellowish white. Two or more black stripes on the sides longitudinally, occasionally bent, broken, inclined, or interrupted. Near the tail two or more lines at right angles with the former, and sometimes crossing their extremities.

Dorsal and anal fins far back, and opposite. The thick round body firmly covered with adhering scales. Lateral line obscure.

Rays, Br. 5. P. 18. V. 5. D. 15. C. 25. A. 11.

(a) *Var.* There is a variety of this species, in which the longitudinal black stripes are wholly wanting; and where the transverse or perpendicular lines, sometimes to the number of twenty, mark the sides of the fish from head to tail; giving him an appearance which has been mistaken for that of the *yellow-bellied killifish,* to be soon described.

(b) *Var.* With continued lines alternated with dotted lines.

(c) *Var.* With a horizontal line above, and interrupted slanting lines below it.

2. *Pickerel.* (*Esox lucius.*) With blunt nose, lower jaw somewhat longer, greenish yellow sides, and streaks of pale brown.

A variety of E. lucius, measuring twenty-two inches long, by five deep; though he often grows much larger.

Head long, grooved, and flattish. Nostrils double. Upper jaw resembling, in some degree, the bill of a duck. Lower jaw rather longer, and turning up a little at the end.

Mouth and throat very wide. Gill-openings ample. Tongue moderate and loose; its extremity bifid, and its middle roughened with small teeth. Lower jaw armed with sharp teeth of different lengths and sizes. Palate beset with three patches of teeth arranged lengthwise. The teeth in all these patches moveable one way, like those of cards. They yield to any substance entering the mouth and throat, but rise and make resistance to every thing withdrawn from the mouth. Teeth of the outer patches inclining obliquely inward.

Dorsal and anal fins far back, and opposite to each other. Body stout and thick. Back rather flat, with a longitudinal groove. Lateral line straight, though not easy to trace.

Colour of the back dark brown. Gill-covers and sides greenish yellow, with mottled streaks of paler brown. Gill membrane and pectoral fins reddish. Anal brown, inclining to ruddy. Dorsal and caudal brown. Belly whitish red, or carnation. Tail forked.

Rays, Br. 15. P. 12. V. 9. D. 16. A. 14. C. 21.

Inhabits fresh waters; the brooks and ponds of Long-Island.

3. *Yellow-bellied Killifish.* (*Esox pisciculus.*) With faintly zoned sides, and yellow belly.

Length four inches; depth one. Head broad, thick, and flattish. Eyes on the sides, and far apart. Firm covering of scales. Lower jaw rather jutting. Gape not very large, but its cavity ample. Gill-openings free. Eyes yellowish.

Anal and dorsal fins opposite. Tail broad and even. Belly yellow. Sides marked by parallel pale or yellowish narrow zones, to the number of ten or a dozen, through the greenish or olive of the back and sides.

Ventral and anal fins yellowish. The rest pale brown. Jaws have a set of sharp little teeth. Lateral line obscure.

Frequents the salt tide waters.

Rays, Br. 5. P. 15. V. 6. D. 12. A. 11. C. 27.

4. *White-bellied Killifish.* (*Esox pisculentus.*) With uniform sides, and white belly.

Four inches long, and one deep. Head thick, flat, smooth, and chubby. Under jaw rather longer. Tongue plain. Irides yellow. Mouth moderate, and armed with very small acute teeth. Gill-opening considerably wide.

Body covered with firm scales. Dorsal and anal fins directly opposed. Tail wide, strong, and even at the end Back olive or pale brown. Sides paler. Belly white. Lateral line indistinct.

Follows the ebb and flood of the sea water, in company with the preceding species.

Rays, Br. 5. P. 15. V. 6. D. 13. A. 11. C. 27.

5. *Sheep's-Head Killifish.* (*Esox ovinus.*) With a short chubby body, mottled sides, and a semi-transparent extremity of the tail supporting the caudal rays.

Length about an inch and a half; and remarkably large in the girth. Lives in the salt water, after the manner of other small fishes of the same family; but is more rare than the other sorts.

Figure thick and deep at the thoracic and abdominal parts. Head flat and somewhat elongated. Mouth capable of considerable elongation and distention. Tail broad, and semi-transparent at the end, having the appearance of a piece or strip of a different kind, added to the main body.

Colour pale, generally, with white belly, and silvery gill-covers. A few faint traces of lines lengthwise; and brownish mottles or marks, not quite amounting to bands or zones, distinguishing the sides perpendicularly.

Eyes moderate, lateral, and yellowish. Brows distinct and prominent. Body coated, with firm and adherent scales. Ventral fins small, and far back on the abdomen.

A row of sharp little teeth in each jaw; and the mouth, which is ordinarily small and contracted, may be dilated to a gape of considerable width.

Lateral line plain and straight.

The dorsal and anal fins are not in such regular opposition as in the other species; the former being nearer the middle of the back, and the latter immediately behind the vent.

Rays, Br. 6. V. 7. P. 11. D. 11. A. 9. C. 17.

6. *Trout Pike.* (*Esox salmoneus.*) With two dorsal fins, the hindmost of which is rayless and adipose, eel-shaped body, forked tail, and lower jaw shorter than the upper.

Length eight or nine inches, and figured somewhat like the eel, tapering away from the middle toward the head and tail. Caught in the bay of New-York.

Head flat. Snout pointed. Eyes lateral, large, rounded, and pale.

Mouth wide, and furnished with small, distinct, and sharp teeth, along the margin of the jaws, and on the tongue and palate. The lower jaw is shorter than the upper, and shuts within it in such a manner that the superior teeth have a grinning appearance. Gill-covers very large, and their openings ample.

Body well coated with scales. Colour brown, with specks of dirty white, and dark brown interspersed. Belly a dull white. Gill membrane yellowish. Lateral line distinct, and nearly straight. Fins brown, except the ventral, which are yellowish, and the rays incurvated toward each other.

Two dorsal fins, of which the foremost is about the middle of the back, and consists of twelve rays; and the hinder is near the tail, small, membranous, or adipose. Under the latter is the anal fin, which is composed of twelve rays. The branchial membrane has thirteen rays.

Rays, Br. 13. V. 7. P. 14. D. 12—0. A. 12. C. 19.

7. *Banded Killifish.* (*Esox zonatus.*) With a white belly, flat head, and a dozen or more transverse marks down the sides.

A very delicate fish, scarcely more than an inch long; inhabiting the salt water, as the other species do.

Belly white; back brown; and sides marked by about twelve perpendicular blackish and nearly equi-distant bars. Body semi-transparent,

Head flat, broad, and tapering wedgewise to the neck below. Eyes on the sides, large, and faintly yellowish. Brows at the extremities of the crown. Lower jaw longer.

One dorsal fin situated toward the tail. One anal opposite to it. Ventral fins far back. Skin well protected by scales. Caudal fin broad, and rather convex.

Mouth rather small; but capable of such elongation as to appear almost rostrated. Teeth very minute.

8. *Bill-fish.* (*Esox belone.*) Blue green above, silvery beneath, and very long toothed jaws.

Is nearly twenty-four inches long, and one and a half deep; being cylindrical and slender.

Mouth rostrated, with rows of acute teeth in both jaws. The distance from the angle of the mouth to the tip of the lower jaw four inches and a half. Eyes large, with a mixture of silvery and dark.

Body round cylindrically, and the belly somewhat flattened. Two longitudinal, smooth, and parallel ridges extend along the back to the dorsal fin.

A carinated line on each side of the belly, running from neck to tail, rising over the ventral fin, and at the extremity of the anal bending upward, so as to enter the caudal midway.

Colour of the back a fine green. At the sides of it, lines of beautiful blue, bordering upon purple. Sides and belly a splendid white. A smutty patch on each side of the gill-covers, as if made by a bruise in lifting or pinching him with the fingers.

Vent very far back, and about two inches and a half behind the ventral fins. Throat wide and greenish. Upper mandible articulated moveably to the head. Nostrils large, and of a bright green. He is a good fish to eat; and his bones turn green by cooking.

In an individual which I dissected, a full-grown esox pisciculus was found half digested in his stomach. The alimentary canal is without convolutions; the intestine proceeding straight through.

In other respects, this fish corresponds sufficiently well with the modern descriptions. An exclusive inhabitant of the salt water.

Rays, Br. 14. P. 12. D. 15. V. 6. A. 18. C. 19.

9. *Bony-scaled Pike.* (*Esox osseus.*) With square scales of a bony hardness covering the skin with mail, a long rostrated and toothed bill, and eyes placed far forward.

A few years ago I had a large and complete specimen from Long-Island, which agreed, in the main, with the descriptions extant. A specimen that I examined in Scudder's Museum, is about three feet long.

Digitized

ELOPS.

Generic character.

Head smooth. Edges of the jaws and palate rough with teeth. Gill membrane with thirty rays, and armed on the outside in the middle with five teeth.

Smooth Elops. (*Elops inermis.*) With smooth forked tail, and a single dorsal fin supported by a membranous prop on each side.

In September, 1813, a splendid fish was sold in the New-York market under the imposing name of salmon trout. An individual which I bought was twenty-two inches long, and weighed forty-two ounces.

The gill membrane had thirty rays. The back dark coloured. Belly and sides silvery white. Lateral line almost straight.

The tail was considerably forked. There was but one dorsal fin, and a rayless membrane on each side of it, sheathing it to the height of a quarter of an inch. He was exceedingly showy and handsome, and brought the seller three quarters of a dollar a fish.

Mouth ample and capacious. Jaws rather rough than toothed. Tongue very small, and situated on the spot where the branchial arches unite. Its surface rough, like that of the jaws. No proper teeth.

Rays, Br. 30. D. 24. V. 15. A. 15.

ATHERINA. ATHERINE.

Generic character.

Head somewhat flattened over the upper jaw. Gill membrane six rayed. Body marked by a silver lateral stripe.

1. *Large Silverside.* (*Atherina mordax.*) With wide mouth, sharp-toothed jaws, the lower one longer; second dorsal fin fleshy.

Seven inches long, and rather more than one deep.

Mouth very wide and capacious. Tongue distinct, though small.

Jaws, tongue, and palate, armed with sharp and separate teeth, making a formidable apparatus for a small fish. Lower jaw longer than the upper.

A white satin-coloured riband from head to tail, along the broad side. Below that stripe, the belly silvery bright. Above it, the back of a semi-transparent paleness.

Eyes large, with silvery irides. Tail forked. Two dorsal fins, the hinder of which is fleshy. Vent far back. Oblique lines along the sides, like ribs.

Rays, Br. 7. P. 12. V. 8. D. 10—0. A. 17. C. 23.

2. *Small Silverside.* (*Atherina notata.*) With moderate and distensible mouth, two radiated dorsal fins, upper jaw longer, and dotted anal rays.

Length five inches; depth about one.

Mouth moderate, or rather small; yet susceptible of considerable elongation and distention. Upper jaw somewhat jutting.

Jaws armed with a row of acute, even, and thickset teeth.

A satin stripe the length of the body. Back and tail delicately semi-transparent, or of a pale horny colour. An opaque white overspreads the intestinal portion of the belly.

Eyes large and silvery. Tail forked. Two dorsal fins, both radiated.

Dark dots at the insertion of the anal rays. Brownish lines on the hyaline back, marking the spaces between the scales, which are easily deciduous. Pectoral fins high on the thorax. Tongue small and smooth. Vent midway. Ribs visible by plain external traces.

Rays, Br. 5. P. 12. V. 5. D. 4—9. A. 25. C. 17.

Digitized

3. *Green-striped Silverside.* (*Atherina viridescens.*) With large head, bright eyes, and a dark green line from head to tail, over the white stripe, and parallel with it.

Lives in the salt water with the other killifish, sticklebacks, and shrimps. Is exceedingly small, very delicate, and semi-transparent. A greenish line runs lengthwise from the gill-opening to the tail, in contact with a white riband. Back and tail transparent.

Mouth small. Head big. Eyes lateral, spacious, and bright yellowish white. One dorsal fin. Ventral fins on the abdomen, and pretty far back. No teeth. Belly silvery and opaque.

Length scarcely more than an inch; and shape remarkably slender from the head.

MUGIL. MULLET.

Generic character.

Lips membranaceous; the inferior carinated within. Teeth none. At the corners of the mouth an inflected callus. Gill membrane with six curved rays. Body fleshy. Scales large. Dorsal fins two.

New-York Mullet. (*Mugil albula.*) Pale whitish colour, with four rays in the first dorsal fin.

Head compounded of flat, square, and blunt.

Lips thin, soft, and having edges like minute teeth; but which are destitute of hardness when felt.

Lower jaw shorter. Body chubby and round.

Rows of distinguishable scales arranged around the whole circuit of the body, having a distant resemblance to stripes. The colours pale brown, alternated with dirty white.

Pectoral fins high on the thorax. Twelve or thirteen rows of scales on a side. Lateral line obscure among them.

Tail concave, but scarcely amounting to a fork. Eyes rather large. Two dorsal fins, the first of which is spinous. Two first anal rays spinous.

An acquaintance of mine caught a mullet that weighed two pounds and a half; and this is the heaviest that is remembered.

Rays, Br. 4. P. 17. V. 6. D. 4—9. A. 10. C. 15.

EXOCŒTUS. FLYING FISH.

Generic character.

Head scaly. Jaws connected on each side. Gill membrane ten rayed. Pectoral fins very large, giving the power of flight.

1. *Middling Flying Fish.* (*Exocœtus mesogaster.*) Silvery blue flying fish, with the ventral fins situated on the middle of the abdomen.

The specimen I examined was rather less than four inches long; and was brought from the ocean somewhere to the south.

The pectoral fins reached back almost to the tail; and the ventrals were situated midway on the belly.

2. *Single-bearded Flying Fish.* (*Exocœtus comatus.*) With single cirrhus to the chin.

Five inches was the length of the one from which the present description is made.

Back brown. Belly shining white. Lateral line straight.

Pectoral fins reach as far back as the posterior extremity of the dorsal. Ventral fins long, and situated far behind.

Scales deciduous, and the lines between them decussate.

But the greatest peculiarity is a cirrhus or string of two inches and a half in length depending from the chin, at the extremity of the lower jaw. This excrescence is single, blackish, tough, and elastic.

Rays, P. 12. V. 6. D. 11. A. 6.

3. *Double-bearded Flying Fish.* (*Exocœtus furcatus.*) With a double cirrhus.

The individual I examined was three inches long, with large eyes.

Belly carinated on both sides; but not serrated. Ventral fins ample and placed about two thirds of the distance between the pectorals and the vent.

Two cirrhi or tough appendages, half an inch long, hanging from the chin.

Scales small and adhesive, forming a complete and durable covering for the back and sides, and arranged in rows that may be counted.

POLYNEMUS.

Generic Character.

Head compressed, covered with scales, snout very obtuse and prominent. Gill membrane five or seven rayed. Separate filaments or setaceous processes near the base of the pectoral fins.

Three-fingered Polyneme. (*Polynemus tridigitatus.*) The individual I examined belonged to this genus, and had three appendages from the anterior part of the thorax.

CLUPEA. HERRING.

Generic Character.

Side plates of the upper mandible serrated. Gill membrane eight rayed. Gills internally setaceous. Abdomen sharp and generally serrated.

* With serrated bellies.

1. *Shad.* (*Clupea alosa.*) With dusky back, shining sides, deciduous

scales which expose dark spots in a row as they fall off, and belly carinated with deciduous scales.

Comes from the ocean, and visits us at New-York, in an annual migration regularly about the end of March or beginning of April. Is highly prized by the people as an article of food. Is consumed largely in a fresh state; but is reckoned very good when pickled in salt.

Ascends toward the sources of the Hudson and the other North American rivers to breed. Usually weighs from four to five pounds; but has been taken as heavy as twelve pounds.

Is so well described already in the books, that repetition is deemed unnecessary.

I cannot, however, forbear to add the following note taken by myself from an inspection of one of the fairest specimens of New-York shad.

Head small. Tongue smooth. Lower jaw shuts into the upper. Back arched. Belly gibbous. Body plump. Tail forked.

Belly carinated and serrated, with scaly plates on both sides.

Back brown, bluish, greenish, and brassy, in individuals of the same draught and parcel.

A dark spot near the gill-opening; and behind it and along the side, a row of about six or eight more which are undistinguishable when the scales are on, but appear instantly when they are removed. Scales readily deciduous. Upper lip bifid.

2. *Staten-Island Herring.* (*Clupea mediocris.*) Grows very large for a herring, being frequently eighteen inches long, and almost as big as small shad.

Six or eight brown spots longitudinally below the lateral line. The first one distinct and permanent, the others fainter, and sometimes scarcely discernible. All, save the foremost, covered by the scales. Considerable yellow-green about the head and gill-covers. A stripe of paler hue encompasses the lateral spots.

Back brownish. Belly white, and its edge deeply serrated.

Dorsal fin about midway of the back. Ventrals opposite. Mouth and tongue quite smooth. Upper lip slightly bifid. Tail deeply forked. Lower jaw double, elongated and furnished with a teat to suit the bifid notch.

Is reported to be an inhabitant of that part of the bay of New-York which borders on Staten-Island.

Rays, Br. 8. P. 16. V. 9. A. 20. D. 16. C. 27.

3. *New-York Herring.* (*Clupea halec.*) Has no spots on the sides. Back variegated with intermingling shades of blue and green.

Beneath the lateral line a yellow stripe. Sides below, a silvery white.

Belly serrate. Tail deeply forked. Mouth and tongue smooth.

Rays, Br. 7. P. 16. V. 9. D. 16. A. 19. C. 21.

4. *Long-Island Herring.* (*Clupea mattowaca.*) Called also the autumnal or fall herring.

Length frequently from twenty inches to two feet; and depth from four and a half inches to six. Is caught most commonly in autumn, and brought to market with the fall running of striped perch, or rock fish. In October and November the present fish is taken in seines of the surf-side of the beaches fronting Long-Island. He occupies a middle station between the shad and the Staten-Island herring. The individual before me, a middling one, weighed twenty-two ounces. Sometimes reaches four or five pounds.

Beside the general features of the clupea tribe, the present species has the following marks. A lower jaw thick, double, and projecting. The upper jaw slightly bifid. There is a little eminence on the tip of the lower jaw to suit the notch in the upper. When the mouth is closed, the extremity of the chin is the most projecting part of the head. The eyes are large and yellowish. There is a sooty spot behind the gill-opening, above. The dorsal fin is single, consisting of seventeen rays, placed about the middle of the back; and the ventrals are almost exactly opposite to it below. These latter consist of nine rays. The pectoral fins are situated far forward, and composed of sixteen rays. The belly is serrated as well as carinated; and the serræ are more and more distinct, as they approach the vent.

The colour of the back is brownish, with but weak tints of green and fainter of blue. Below the green shading, there is a faint riband of yellowish, about three quarters of an inch wide from head to tail. Below this the skin whitens toward the belly.

The scales are deciduous and silvery. And, as in various other species of this genus, the true complexion and hue can only be distinguished after their removal.

The anal fin and the caudal have each twenty-one rays, and the branchial seven. The tail is profoundly forked, and when naturally expanded measures between four and five inches across from one extremity to the other.

Some call this fish the *shad herring*, and some the *fall shad*. He is reckoned to be almost equal to the shad, as an article of food. He is probably the full grown fish of the *mediocris* species. Though I have marked them as different, they certainly approach so near that it is impossible to discriminate the species in many individuals.

5. *Tiny Herring.* (*Clupea pusilla.*) About six inches long. Three faint lines or stripes, lengthwise along the back, with imperfect vestiges of more.

Belly serrated. Tail forked. Figure and colour so much like the C. halec, that he is not improbably the young of that species.

Rays, Br. 7. P. 14. V. 9. D. 14. A. 18. C. 21.

6. *Little Herring.* (*Clupea parvula.*) About six inches long, having neither stripes nor spots.

A little greenish about the head, gills, and eyes; but neither green nor blue on the back or sides. Back of an unmixed, though not deep brown, which passes through regular gradations of hue to a silvery whiteness on the sides and belly.

Has a delicate, and, as it were, a semi-transparent appearance.

Tail forked. Belly serrated.

Rays, Br. 6. P. 14. V. 9. D. 14. A. 18. C. 21.

7. *Bony-fish, Hard-heads, or Marsbankers, of New-York.* (*Clupea menhaden.*) About fourteen inches long. Frequent the New-York waters in prodigious numbers. From the high banks of Montock, I have seen acres of them purpling the water of the Atlantic ocean. The waters of Long-Island sound, and its bay, are often alive with shoals of them. They are eatable; but as they are too abundant for consumption as food, and as there are multitudes of preferable fish, menhaden are often left to putrify on the shore, or are removed to the fields for manure.

The history of this fish has been written by Mr. B. H. Latrobe, and published with a figure, in the Philosophical Transactions of Philadelphia, vol. v. And the manner of converting him to an ingredient for fertilizing land, has been explained by Ezra L'Hommedieu, Esq. in the Agricultural Transactions of New-York, vol. i. p. 65. The aborigines called him menhaden.

The whalemen say he is the favourite food of the great bone-whale, or balæna mysticetus. This creature, opening his mouth amidst a shoal of menhaden, receives into its cavity the amount of some hogsheads of menhaden at a gulp. These pass, one by one, head foremost, down his narrow gullet; and eye witnesses have assured me that, on cutting up whales after death, great quantities of menhaden had been discovered thus regularly disposed in the stomach and intestines.

Gill-cover very large. One blackish spot on the neck near it.

Head and back greenish brown, with a few marks of brighter green on the head. Belly and sides considerably iridescent.

Back arched, rounded, and thick. Tail forked. Belly serrated.

Mouth and tongue toothless and smooth. Gills rising from the back of the tongue on both sides of the wide throat.

Rays, Br. 7. P. 15. V. 7. D. 19. A. 19. C. 27.

8. *Sprat Herring of New-York.* (*Clupea indigena.*) In its general aspect and character, this fish resembles the C. parvula, before described. But is, however, rather larger, and has a brownish-green spot on the upper part of the branchial opening.

He is somewhat green about the head, gills, and dorsal fin.

The rest of the back pale brown, or a sort of leaden colour, brightening up to a silvery along the sides and belly. The latter strongly serrated.

Rays, Br. 7. P. 15. V. 9. D. 16. A. 19. C. 25.

9. *Spring Herring, or Alewife.* (*Clupea vernalis.*) Comes with the shad to New-York, in the latter part of March and the first of April, annually. Is about twelve inches long, and three deep. Called *alewife*, probably from the French *alevin*, the young fish rejected as being under size.

Lower jaw longer than the upper, and the upper slightly bifid. Head rather small, and inclining to a pale brassy yellow. Eyes large, and yellowish white. Back bluish green, with tints of purple occasionally. Lateral line very faint. A light brassy stripe, about an inch wide, though not nicely defined, extending between the upper part of the gill-opening and the tail, with sometimes traces of four or five cloudy lines. The rest of the sides and belly bright as alloyed silver.

Belly strongly serrated, particularly between the abdominal fins and the vent. The anal fin has sometimes seventeen rays, though the more usual number is nineteen.

Behind the branchial opening, and on the thorax, a scaly plate, and a dark spot. A row of four or five other lateral spots sometimes to be counted on different individuals of the same parcel or draught. Tail deeply forked. Scales very easily deciduous. Mouth toothless. Gill-openings ample.

A row of cuspidated marks, caused by internal bones on each side of the belly, arising from the carinated edge, and lapping on as it were with the ribs. Is one of nine or ten species of clupea that visits New-York.

Rays, Br. 7. P. 15. V. 9. D. 17. A. 19. C. 21.

We are informed, upon very good authority, that this very species of fish used to spawn in Crumpond, a source of the Peekskill, and in lake Otsego, at the head of the Susquehannah. Thither the herrings went yearly to breed, by the way of the Chesapeake and the Hudson. And they have discontinued their visits only in consequence of being excluded by the mill-dams erected across the stream.

The like impediments have shut them out of many places on Connecticut river, which they formerly frequented.

During the session of the New-York Legislature, at Albany, in 1810, when I was last a representative from the city, in the house of Assembly, there was a strong exertion made to procure the enactment of a statute for facilitating the navigation of the Hudson, between the villages of Troy and Waterford, by constructing a dam with a lock across the river there. I made strenuous opposition to the bill that had been introduced for the purpose. The grounds of my objections were various. But one upon which I considered myself firmly footed, was the injury which would be wrought to the fisheries in the river by such an obstruction. I contended that by depriving them of access to the places they loved to frequent for the purpose of perpetuating their race, there would be danger of driving them from the river altogether; and I called upon the delegates from Richmond and King's counties near the ocean, to the members from Washington and Saratoga above, to unite in rejecting the preposterous scheme. In the course of my speech, I observed, "that I considered myself the advocate of the fish; I begged the house to view me as the counsel for their silent tribes; like Saint Antonio, I felt a deep concern for their welfare; and I entreated the members to oppose, by a unanimous vote, the adoption of the meditated measure, as big with ruin to the innocent inhabitants of the floods." The project was negatived by a very large majority.

The life of the herring has never been thought important enough to be put under the protection of the law in New-York. Even in the last edition of our statutes, under the revision of Van Ness and Woodworth, no notice is taken of these fish. This may perhaps indicate the diminution of their numbers, and the smallness of the fishery. It is scarcely a public object. In the act of April 5th, 1813, "relative to the fishery in certain waters," salmon, trout, shad, oysters, suckers, pike, and pickerel, are mentioned; but the name of herring does not occur. And the "act declaring certain waters to be public high-ways," &c. passed April 2, 1813, is equally silent of these fish. In the regulation of set-nets in the Hudson river, between Troy and New-York, and of the buoys and stakes connected with them, the intention of the legislature seems rather to have been, the prevention and removal of obstructions, than the preservation of any species of fish.

10. *Summer Herring of New-York.* (*Clupea æstivalis.*) Has a row of spots to the number of seven or eight, extending in the direction of the lateral line.

Tail forked. Belly serrate; and, in most respects, resembling the C. halec, herein already described.

Rays, Br. 6. P. 15. V. 9. D. 16. A. 19. C. 19.

11. *Satin-striped Herring.* (*Clupea vittata.*) With large projecting upper jaw, small lower jaw, silver-striped sides, and forked tail.

Length about three inches and a half, depth rather more than half an inch. Inhabits the salt water, and resembles an atherine.

The upper jaw is much more considerable in size, than the lower, and terminates in a distinct nose or snout. Beneath it, the lower mandible is received and shuts closely. The mouth has no proper teeth ; but both the jaws have very minute and exact serrated edges. The throat, on examination, is found to be surrounded with a row of bristles, long, and disposed funnel-wise ; and investing the sides of the tongue.

One dorsal fin near the middle of the back. The vent is rather nearer the tail than to the head. The ventral fins are small and six rayed.

The eyes are large and yellowish. Gill-covers silvery white. Belly carinated and moderately serrated. Branchial membrane has eleven or twelve rays. The anal fin has about twenty-one.

12. *Blue Herring.* (*Clupea cœrulea.*) With bluish complexion, large head, forked tail, and small pectoral and abdominal fins.

Length three inches, depth nearly one ; being a deep fish in proportion to his length. The scales are large for a fish of his size, and readily deciduous. The skin is free from spots and stripes ; and is of a bluish colour. This is less considerable on the belly than on the back. The head and eyes are large. The jaws about even. Tail deeply forked. Belly sharply and delicately serrated. Pectoral fins small ; ventral smaller. Body in some degree semi-transparent.

He may possibly be a variety of one of the preceding species ; but I have thought it proper to mention him by himself.

* * Bellies carinated without serræ.

13. *New-York Shadine.* (*Clupea sadina.*) An elegant species with a small smutty spot behind the gill-cover ; but with neither spots nor stripes on its back or sides. Mouth wide and toothless. Tongue small.

Back delicately variegated with green and blue. Lateral line straight. Sides silvery white, considerably above that line ; and below it quite to the belly. The white reflects vividly green, red, and other splendid hues. Head rather elongated. Lower jaw projecting.

Scales very easily deciduous. Form neat, taper, and slender. Gills rise into the throat on each side of the root of the tongue. Eyes pale and large. Tail deeply forked. On account of the even connexion of the false ribs, the belly is not at all serrated, but quite smooth. A semitransparent space in front of the eyes from side to side.

Rays, Br. 7. P. 16. V. 9. D. 18. A. 15. C. 19.

CYPRINUS. CARP.

Generic character.

Mouth small and toothless. Teeth in the throat. Gill membrane three rayed. Ventral fins in general, nine rayed.

1. *Fresh-water Sucker.* (*Cyprinus teres.*) With elongated round body. Low, soft, puckered mouth, and tail nearly even.

Mouth under, toothless, and with a soft and puckered orifice.

Head rather small. Back thick and round, (cylindrically.)

Back and sides a speckled black and white. Belly whitish. Pectoral, abdominal, and anal fins yellowish. Dorsal and caudal dark brown.

Lateral line straight. Abdomen large and frequently flabby. Rays of the fins coarse. Tail almost even.

Inhabits fresh brooks, ponds, and rivers, and in many of them is taken very abundantly. Grows to the size of twelve and fifteen inches.

Is extensively employed in the interior districts for food. And as we find him in the New-York market, is a tolerably good, though rather a soft, fish. Is, perhaps, the *C. catastomus.*

I found, on anatomizing him, a curious division of the swimming bladder into two sacks or cells, having connexion by a small tube.

Rays, Br. 3. P. 17. V. 9. A. 8. D. 13. C. 19.

2. *Chub of New-York.* (*Cyprinus oblongus.*) Mouth under, small, puckered, and toothless. Head somewhat depressed and smooth. Eyes rather small. Gill-openings rather narrow. Pectoral fins very far forward on the neck. Back arched and approaching to gibbous. Body thick, but may be rather termed deep than round.

Back deep brown, inclining to black, with whitish scales. The lines between the scales, dark and decussating each other so as to leave rhombic spaces between them. The lines are darker coloured than the spaces they define.

Belly a pale cream colour, with golden spots or tints, particularly between the pectoral and ventral fins, and near the anal.

Pectoral and ventral fins dusky, with a reddish tinge. Anal, caudal, and dorsal, dark brown.

Lateral line obscure. Tail rather concave.

Rays, Br. 3. P. 15. V. 9. D. 14. A. 8. C. 19.

Lives in fresh streams and lakes like the sucker.

3. *New-York Shiner.* (*Cyprinus crysoleucas.*) With lateral line crooked downward.

Mouth small, even, and toothless. Head smooth and rather diminutive; and lengthened, or depressed on the upper side. Flesh soft. Scales deciduous. A single dorsal fin, and that situated far back.

Eyes large in proportion to the head, and bright; body deep in proportion to its length.

Colour blackish, with shining white scales. Gill-covers golden, with a tinge of the same along the belly. Head often greenish; and when the scales fall off, the back is frequently tinged with green and blue.

Lateral line bends downward to correspond with the curve of the abdomen. This appears only when the scales are on; there is another and a straight one which appears only when the scales are off.

Pectoral and ventral fins, particularly the latter, yellowish brown. Belly whitish, with a ruddy tinge. Tail forked.

Lives in the ponds inhabited by the preceding species, and by the labrus auritus, and bodianus flavescens.

Rays, Br. 3. P. 17. V. 9. D. 9. A. 14. C. 19.

4. *Brook Minnow.* (*Cyprinus atronasus.*) With a dark stripe extending round his nose and lengthwise to the end of the tail; and a white lateral line inclined downward.

Length about two inches and a half. Lives in the fresh-water brooks, inhabited by trout.

A blackish or dark stripe surrounds the nose, and passes through the eyes, and imparts to them a part of its colour. The rest of the iris yellowish white. Colour of the back, brown, interspersed with blackish spots. Belly shining white, with a few blackish stains. Body scaly. Tail yellowish. Nostrils distinct.

Lateral line bends downward, and is distinguishable like a white trace.

Mouth toothless. Tongue distinct. Eyes lateral, and rather large. Gill membrane three rayed. Pectoral fins orange coloured. Tail forked.

Rays, Br. 3. P. 12. V. 9. D. 7. A. 7. C. 19.

Order, CARTILAGINOUS.

PETROMYZON. LAMPREY.

Generic character.

Body eel-shaped. Mouth beneath, with numerous teeth in circular rows. Spiracles seven on each side of the neck.

Great Lamprey. (*Petromyzon marinus.*) With brown and olive variegations, with fins some orange and reddish, and a bluish tail.

Two feet and a half long. Is caught in the salt water.

On dissecting the gullet, heart, and respiratory organs of a large one, on the 9th April, 1814, they were found to correspond almost exactly with the anatomical descriptions of Bloch and Shaw ; and the external characters are so alike, that the variations are too inconsiderable for notice.

ACIPENSER. STURGEON.

Generic character.

Snout bearded beneath. Mouth beneath the head, ovate, toothless, retractile. Body elongated, mailed above by scaly tubercles.

1. *Round-nosed Sturgeon.* (*Acipenser sturio.*) Gray scale-shielded sturgeon, whitish, and often reddish beneath, a five-fold apparatus of scales, and a blunt snout.

Has a roundish and elongated snout with four cirrhi. There are five rows of scales, making the body a sort of pentagon. Two lateral fins arising from the lateral scaly rows, somewhat forward of the vent. Dorsal fin behind the scales near the tail, and composed of thirty-eight rays.

Anal fin nearer the tail than the dorsal. Tail unequally forked, and the larger division slanting upwards.

Caudal, anal, lateral, and pectoral fins often reddish.

The blunt snout grooved between the eyes.

Twelve scales between the head and dorsal fin; twenty-nine or thirty on the upper side-rows between the gill-opening and tail.

On examining the alimentary canal, the stomach was found very much to resemble, in its strong and knobbed muscular organization, the gizzard of birds, and was filled with small bivalve shell fish. Roes, in the female, blackish and very numerous, filling much of the abdomen.

Frequents the Hudson, and, during the hot season, is remarkable for leaping his whole length out of water, and splashing clumsily as he returns.

2. *Sharp-nosed Sturgeon.* (*Acipenser oxyrinchus.*) Having a pentagonal form, with scabrous asperities between the scales, and a sharp snout.

Agrees in many respects with the preceding species; having, like it, five sides and as many scaly angles. Whether the individuals now under consideration, differ from the *A. sturio* merely in sex and age, has been made a question. But the dissimilitude of the *blunt*-nosed and *sharp*-nosed sturgeon, is very obvious. The mouth, nostrils, and eyes, are different.

The number of scales in the sharp-nosed sturgeon, is not so great as in the blunt-nosed. On all the angles they are less numerous. The skin is more scabrous. The asperities between the scales, are very distinct, and scratch the finger like a grater when moved along them, especially from tail to head. The points resemble the spiculæ of minute crystals, occupying much of the space between the scales.

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The scales themselves are bony, rough, and serrated behind, and very distinct in their configuration. There are four scales between the vent and the anal fin; the two foremost of which make a pair; and four more between the anal fin and the tail, the two foremost of which lap over the base of that fin in some measure, and support it. But sometimes there are more, and at other times fewer.

There is osseous matter on the sides of the snout, and a strip of the same beneath it, reaching from the tip toward the mouth.

The boys remark, that the gristle taken from the sharp-nosed sturgeon, is much less elastic than that of the blunt-snouted, and that a ball made of it does not bounce so well.

Grows seldom to a greater length than five feet. Is found in the Hudson plentifully, in the neighbourhood of Albany. My friend Simeon De Witt, Esq. informs me, "they are every year brought to the market of that city, under the name of *young* sturgeon. I suspect them to be of a different species, for two reasons. 1. Because there is no intermediate size between the largest of these and the smallest of the common sturgeon; and 2. The females of the smaller sort are all filled with spawn."

LOPHIUS. ANGLER.

Generic character.

Head depressed. Teeth numerous and sharp. Tongue armed with teeth. Pectoral fins brachiated.

1. *Toad-fish.* (*Lophius bufo.*) With semi-circular cirrhous dots under his eyes, loose pursy, skin, and brown, clouded, and mottled complexion.

Length about twelve inches; breadth almost four; depth two. An inhabitant of our salt water.

Cheeks full, and appearing as if bloated. Neck very thick, and seeming to be merged in the head and thorax. The chubby and clumsy forepart tapering away exceedingly toward the tail.

Skin scaleless, slimy, adhesive, and covering the body loosely like a shirt. A dozen or fourteen soft skinny cirrhi beneath the lower jaw. A diligent search will find a larger one near each angle of the mouth. Projections of a cirrhous kind, discoverable by nice observation along the forepart of the upper jaw. A row of small and soft tubercles under each, to the number of eight or more ; and to be traced along with some interruption, to the upper part of the tail.

Mouth enormous. Eyes approximated, prominent, dark-hyaline, and surrounded by the soft yielding skin. Branchial rays enveloped in the same lax and tenacious covering.

Upper lip furnished with a set of small and not very sharp teeth. Upper jaw itself armed with a stronger and larger set, which are more blunt. Lower jaw supplied with teeth like those of the upper, which at the front are more clustered and numerous.

Tongue conspicuous and smooth. The same laxity of the integuments in the mouth that distinguishes the external surface.

Colour light brown, clouded, and mottled all over with dark brown, excepting the belly, which is of a flesh colour, with yellowish from the chin to the vent, interspersed here and there with blackish marks.

Several processes imperfectly spinous at the hinder part of the gill-cover.

When the mouth is shut, the lower jaw rather projects and shows its front teeth.

Gill-opening moderate and single on each side ; directly before the pectoral fin. That fin stout, brachiated, and ending in flexible rays. Its circumference roundish, and banded across with dark upon the paler ground.

Two dorsal fins, whereof the first is bluntly spinous, enveloped in the loose wrapping skin.

Second dorsal and anal clouded obliquely. Caudal banded transversely.

First ray of the ventral fins incurved, and covered with pleats and puckers ending in a skinny point.

A spot like an excretory duct in the axilla, behind the pectoral fin.

Soft and inconsiderable eminences on various other parts of the body.

Ventral fins a little forward of the pectoral.

Rays, Br. 6. P. 19. V. 2. D. 3—27. A. 21. C. 12.

2. *Bellows-fish, or common Angler*. (*Lophius piscator*. With broad head, enormous mouth, jaws armed with sharp teeth ; and a row of cirrhi all around the chin, and extending to the pectoral fin on each side.

The length of the individual now before me, is three feet ; and the greatest breadth, without including the pectoral appendages, sixteen inches. His depth about three inches and a half. He was taken with a hook, in the Atlantic ocean, near New-York, by a man who was fishing for cod. The present specimen is considered a small one, for the species.

The colour of the back was a brownish olive, and of the belly white, with a dirty tinge behind. There are no scales ; and the skin is loose, and may be pulled from the flesh in folds.

There is a row of cirrhi, some of which are rather more than an inch long with foliated edges around his chin ; and reaching along on both sides to the pectoral fins. Between, and among these, are numerous smaller ones irregularly disposed. From the pectoral fins quite to the tail, the sides are beset with cirrhi, some of which are an inch in length. They occupy a limited space along the sides, but are not planted straight nor in a row.

There is a ray almost seven inches long, which arises at the distance of an inch and a half behind the upper lip. Three quarters of an inch behind this, and further back on the head, is a second ray of about the same length. The former is furnished at the tip or summit, with a fleshy cirrhus of nearly two inches long; the latter has no such addition, but is bare. Four inches behind the latter of these, is a third solitary ray, with more of a membranous connexion than either of the former. This may be called the first dorsal fin. Three inches behind this, are three rays associated and connected by a membrane. The foremost of these exceeds three inches in length. These may be called the second dorsal fin. Four inches behind this, commences another fin, which may be truly denominated the third dorsal. It consists of twelve rays, covered with the skin.

The pectoral fin or appendage, contains twenty-seven concealed rays. The branchial membrane is large and loose, containing five rays on each side. The caudal fin has eight coarse and forked rays. The anal fin has ten rays. Each ventral fin contains five rays that are covered by a white and somewhat puckered skin, and bear some resemblance to a hand.

Both the lips and jaws are armed with acute and conical teeth, some of which are half an inch long, and many of them are sheathed with skin or membrane. The palate and throat are patched with parcels and spots of teeth.

There is a large bony process on each side, between the head and pectoral fin, a few inches forward of the gill-opening: and several other concealed processes about the head.

There are two orbicular cirrhi on the fore part of the upper jaw.

He is called by some the *bellows-fish*, from some resemblance his figure bears to a bellows, and from a power to inflate or swell himself immediately after being taken out of water. They have named him also the *sea-devil*, on account of his ugliness.

His mouth has an excessive gape. The lower jaw projects. The teeth are commonly exposed. The throat is unusually wide and capacious. The creature may be said to consist of head and tail, with very little intervening body. The gill membrane is extensive and flabby, containing cavities from the opening, like pockets.

Var.—Foliated Angler. (*Lophius foliatus.*) With a leafy expansion on his dorsal rays.

Agrees generally with the L. piscator, but the linear tentacula or processes, situated along the back, are some of them expanded at their summits to the form of leaves, and others distinguished at their sides by little knobs resembling vegetable buds.

BALISTES. FILE-FISH.

Generic Character.

Teeth several in both jaws. Body compressed. Abdomen carinated. Skin tough, often reticulated by scale-like divisions.

1. *Tutmouthed file-fish.* (*Balistes broccus.*) With brown skin, serrated horn, and small mouthed turned up.

Usual length seven or eight inches; sometimes more.

Body brown, without lines, spots, or bands; and exhibiting only variations of shades, and a roughness like shagreen.

A single horn rising from a knob between the eyes. The horn straight, slender, and somewhat serrated on its posterior part.

Dorsal and anal fins delicate, and consisting of many rays.

Belly more pale than the back and sides, and pendulous like a pouch. Caudal fin long.

2. *Trigger file-fish.* (*Balistes sufflamen.*) With the skin marked into rhombic divisions.

Length fourteen inches; depth five, exclusive of the dorsal fin. No ventrals. The upper and lower caudal rays longer than the rest ; the central ones longer than those which are situated between them and the lower and upper ones.

Hindmost dorsal fin opposite the anal, and both of them broad, and the distance between their expanded points eight and a half inches.

First dorsal fin three spined. The first ray strong, long, and rough, on the forepart ; the second and third not half so large. The whole three connected by a firm membrane. They are capable of being depressed or let down into a deep furrow. A peculiarity in this dorsal fin, is, that when it is erected, it is kept erect by catches in the bones and soft parts within ; and that if the third ray is pressed downward, the first and second are released from the catches, and descend into the furrow, without impediment. Every beholder traces the resemblance to the lock of a gun, the foremost ray being the cock, and the hindmost the trigger. In the fresh specimen, the catches are four, and determine the angle of the ray's elevation or descent, from about eighty degrees to the horizontal line, or 0. Is said to shed his scales almost immediately after he is taken out of water.

Colour dove or ash, with sometimes a dull zone back of the pectoral fin, and another between the dorsal and anal spreading toward the tail. The skin marked out in lines decussating each other like a file.

Eyes light brown, large, and high up toward the first dorsal. An inch in front of the vent is a rough broad obtusely serrated process ; and from this to the vent, there is a row of naked spines on the carinated edge. On each side of the belly, near this carinated edge, two or three rows of small rough warts or knobs.

3. *Orange file-fish.* (*Balistes aurantiacus.*) Length between sixteen and seventeen inches; depth six ; and thickness (so peculiar is its figure) scarcely more than one inch and a half. He might almost be taken for

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a flounder, when he lies on his side; yet he swims perpendicularly, though he is so remarkably thin and flat.

Mouth very small, and furnished with distinct lips. The upper jaw short and retiring. Lower lengthened and jutting. The teeth seem to be four in each jaw, and present in each three biting points.

Colour all over the body and tail, are orange yellow, except the chin, lips, belly, and the space extending toward the eyes and back, which is of a bluish white. Where the orange predominates, there are variegations of white, and where the white prevails, there are clouds of orange. A sort of semi-transparency permitting the blood vessels to be seen along the cheeks and nose.

Skin rough, without prickles or scales; and feels almost like that of a shark, wearing away the fingers, especially if moved from the tail headward.

A bone or horn between two and three inches long immediately above the eyes. It may be reckoned as a first dorsal fin. It is white, rather irregular, and rough on all sides like the skin. On the posterior part, toward the summit, a small prong or branch. This ray or projection, is capable of being elevated to a right angle, but has a catch, like that of the balistes sufflamen, at about the angle of forty-five.

Eyes large, and situated about midway between the gill-opening and the horn. Colour dark, with a hue of pale green. Gill-opening oblique. Tail convex and rounded. Two small orifices, like nostrils, in front of the eye.

A large ensiform cartilage extending almost from the neck to the vent, and giving protection and form to the belly. No ventral fins. Pectorals small. Belly flabby. Rays of the dorsal, anal, and pectoral fins, dark toward their extremities.

Rays, B. 13. D. 1—34. V. 0. A. 38. C. 12.

Caught at the city of New-York, August 1, 1814, and examination made from the fresh specimen, sent me by Robert Fulton, Esq. a gentleman whose social virtues and inventive talents were of the first order.

DIODON.

Generic Character.

Jaws long, undivided. Body beset with moveable spines.

1. *Spot-striped Diodon.* (*Diodon maculato striatus.*) Having zebra stripes mingled with thorny spots.

Length four inches; breadth about three. Figure of the head and body square and chubbed.

Tail slender, convex, and short. Dorsal and anal fins far behind, and near the tail. Pectoral fins broad and almost rectangular.

Eyes two inches asunder; and their brows prominent and bold.

Four or five rows of stiff and acute prickles run from the orbits of the eyes, and the adjacent space along the back, toward the tail. The sides are also occupied by longitudinal rows of spines. A soft teat-like process on each side, at a small distance from the vent.

So likewise is the belly. But on this part they are shorter. On the back they are nearly a quarter of an inch long.

Colour of the back and sides brown, and white in streaks. Between the mouth and eyes, between the eyes and pectoral fins, and between these last and the tail, the stripes are transverse; but on the back they go lengthwise from the forehead to the dorsal fin.

Behind the dorsal fin, the white and brown lines are oblique, and meet at the ridge. Belly white or orange.

On each side, behind the pectoral fin, a dark spot with a spine in the middle; the spot rather oblong, or of an irregular circumscription, and partly covered by the pectoral fin. In the full-grown individuals, a smooth spot below the dorsal fin amidst the spines. Sometimes a spiny spot obliquely behind the pectoral fin.

I examined the fresh specimen of this species 20th June, 1814.

2. *Hairy Diodon.* (*Diodon pilosus.*) With a covering of bristly hair.

Length about an inch and a half; breadth less than half an inch; depth nearly a quarter; making a blunt lump of a fish.

Is covered all over, back, sides, head, and belly, with bristly hair. The bristles strong and flexible, without the power to scratch or to prick.

Hair about the eighth of an inch in length. Complexion dun or brown; with spots on the back, sides, and toward the belly. Has, at first glimpse, the appearance of a young mouse.

Mouth small, midway, and horizontal. Eyes vertical, lateral, and large. No ventral fins. Pectorals broad. Dorsal and anal very far back; and no hair between them and the tail. This is but a small projection from the thick and clumsy body, and is terminated by a fin of seven rays.

Dorsal, anal, and pectoral fins contain each about thirteen rays.

CEPHALUS. SUN-FISH.

Generic character.

Jaws bony. Body terminating abruptly, so as to resemble the head of a fish.

Short sun-fish. (*Cephalus brevis.*) With a suborbicular body.

The one I examined was harpooned within Sandy-Hook. He is frequently seen on the coast of North America, by mariners. The dimensions of my specimen were these; from the nose to the extremity of the tail, three feet and eleven inches; from the back to the belly, two feet; and from the point of the dorsal to the tip of the anal fin, five feet and one inch. He weighed upward of two hundred pounds. For the generosity of my friend Commodore Rodgers, of the navy, in bestowing a fine preparation of the North American sun fish, see vol. xv. of Medical Repository, p. 195. Sailors have a superstitious reverence for them, and seldom disturb them. Small fishes have been observed to attend them, as pilot fishes do the shark.

TETRODON.

Generic character.

Jaws bony, divided at the tip. Body roughened beneath. Ventral fins wanting.

1. *Curved Tetrodon.* (*Tetrodon curvus.*) With curved back, pouched belly, and brassy complexion.

Length about two inches and a half; depth rather more than one; and girth, when the belly is inflated, nearly three. Inhabits the bays of Long-Island.

The back is considerably arched; and the belly capable of great distention. The back is smooth, and dark brown, variegated with faint bars across. The belly is dull yellow, and roughened by short sharp spines disposed in quincunx. Between the back and belly is a smooth brass-coloured stripe or riband, from head to tail.

Upper teeth project. Mouth small. Lower jaw shuts within the upper. Eyes large and almost halfway between the nose-extremity and the gill-openings. One dorsal fin, and that much behind. Tail tapering, and the rays of its extremity long and rather forked, with fifteen rays.

The pectoral fins are broad, even, and composed of about sixteen rays. The part contiguous to the branchial aperture, is brassy. The dorsal has thirteen rays, growing out of a skinny protuberance. The anal has the same number, situated on a similar process.

2. *Puffer.* (*Tetrodon turgidus.*) With yellowish variegated back, white rough belly, and a remarkable propensity to distend the abdominal sack with air when he is out of water.

Length about twelve or fourteen inches ; depth rather less than two ; and breadth about three. But the belly is loose and flabby ; and it may be distended to a large size, apparently at the will of the fish. This happens frequently after he is taken from the water. The air is inhaled with a sucking or swilling noise. When received into the cavity, it is confined there by a valve in the throat. This valve is so strong, and so tight, that not a particle of air can escape. The hardness equals that of a football ; and the fish will bear to be kicked about without discharging it. I have seen them stamped upon and still retain their charge of air. I have known them to bounce from the surface of a rock, against which they have been thrown, as turgid as ever. And it is a piece of sport, common enough among fishermen, to burst them between two stones, where the air is let loose with a noise almost equal to the report of a pistol.

He is called in some places, *toad-fish,* because his back is mottled with yellow and dark somewhat like that of a toad.

He is taken both in the seine and by the hook. In the former with herrings and flounders ; by the latter in the waters inhabited by blackfish and bergalls. They are very troublesome by nibbling away the bait ; and when catched are in no estimation as food.

When he is out of water, alive, and not in a state of distention, he usually rests on his abdomen, and not on his side ; and his dying struggles exhibit a sort of wriggling motion.

He is found only during the warm season; and often disappears by the beginning of September.

Sometimes when he is distended to hardness with air, and thrown into the water, he floats away to some distance, his white belly resembling a mass of froth: when he suddenly discharges the air, sinks, and escapes.

3. *Mathematical Tetrodon.* (*Tetrodon mathematicus.*) With olive green smooth back, satin-white sides, snow-white belly, and ecliptical lateral line.

The grand specimen of this curious fish, which I examined on the 29th June, 1814, had the following characters:

Length twenty-two inches; depth five and a half; breadth three and a half.

Skin without scales, and on the back and sides smooth. The belly planted with short and acute prickles in quincunx rows.

Colour of the back a dark olive or deep bottle green; of the sides a splendid silky argentine nearly three inches broad, with a delicate cast of green; of the belly a snowy white. All these divisions well defined, without stripes, bands, or spots.

Eyes pale yellow, and surrounded by an irregular line at the distance of an inch and more.

Lateral line departing from the ring encompassing the eye, like a tangent; ascending in a superb curve toward the back; sweeping boldly down from the olive of the back through the satin of the side; and then running direct to the tail; putting one in mind of the ecliptic cutting the equator.

A transverse line from one lateral to the other, above the pectoral fins. Another line from the eye-circle to the transverse line, and parallel to the lateral line, making a sort of parallelogram.

Lips skinny, thick, and loose, resembling almost the human lips.

One dorsal and one anal fin, both far back.

One branchial opening exactly in front of the pectoral fin, which is dark brown, broad at its insertion, and rather lunated at its extremity.

No ventral fins. Caudal fin lunated and bold. Eyes vertical, and across the broad and flat head, three inches apart. Belly lax and pouch-like.

Taken on the south side of Long-Island, and in the bay of New-York.

Rays, P. 17. D. 14. A. 13. C. 11.

SYNGNATHUS. PIPE-FISH.

Generic character.

Snout subcylindric, with terminal mouth. Body lengthened, jointed, mailed. Ventral fins none.

1. *Smaller Pipe-fish.* (*Syngnathus typhle.*) With hexagonal body and pinnated tail.

Length between seven and eight inches. Gill-openings near the back of the neck. Body distinctly hexagonal; or if the line of the belly be considered as making an angle, then it is heptagonal. The seven sides change to four behind the dorsal fin; for the tail is quadrangular and tapering. An imperfect scale behind the vent, with two very small divisions.

Colour a pale brown, with zones of darker brown from head to tail. Is caught frequently in our salt waters during the warm season.

Rays, P. 13. D. 32. C. 9.

2. *Sea-horse Pipe-fish.* (*Syngnathus hippocampus.*) With thick head, subhexagonal, tuberculated body, and quadrangular finless tail.

RAJA. RAY.

Generic character.

Mouth situated beneath the head, transverse, beset with teeth. Spiracles beneath, five on each side of the neck. Body in most species subrhomboidal.

1. *Raja torpedo.* (*The numb-fish or cramp-fish.*) I place the torpedo among our native fishes on the authority of several persons whom I have questioned on the subject. This fish is sometimes taken with the hook and line on Saint George's Bank, and in the ocean near Block-Island, and to the southward of it. The occurrence is so rare, that but few are caught in the course of a season. These, however, make impressions strong enough to be well remembered. I showed to two intelligent fishermen, who had drawn them from the bottom alive, the figure of the animal in Bloch's Ichthyology, and they were instantly struck with the likeness. They said that on loosening the hook from the creature's mouth, the arm of the captor was frequently benumbed for five or six minutes, quite to the trunk. And when a knife was employed to slay the torpedo, the torpor occasioned by the touch of it was great enough to make the instrument fall from the grasp of the fingers. The numbness has been known to continue a whole afternoon, especially in the shoulder.

Evidence to the same point has been collected by Dr. Wiley, a resident on Block-Island, as contained in his letter to Dr. S. Akerly, of November 28, 1814: " You request me, dear sir, to give you what information I possess respecting the electric fish said to inhabit our waters. This fish I have never been fortunate enough to see; and am unacquainted with it, otherwise than by the reports of fishermen. From the concurrent accounts, however, which I have received, I am inclined to believe this singular tenant of our seas is the torpedo. My reasons for this conclusion are the following :

" 1. The electric fish on our coast is known by the name of *numb-fish*. This you know is the vulgar appellation given the torpedo by many Europeans, from whom the term probably passed to our shores.

" 2. The description given of the numb-fish by those who have had opportunities of examining it, corresponds remarkably with that given of the torpedo by various writers.

" 3. On showing the figure of the torpedo to fishermen, they have always recognised a striking resemblance of the numb-fish. Indeed, some have pronounced it the numb-fish at first view.

" 4. The numb-fish is represented as communicating a benumbing shock when touched by the hand, or with a knife. The shock has been known to be so violent as to deprive the arm, for a short time, of all voluntary motion.

" This fish has never been caught, as far as I can learn, except by the hook when fishing for cod. It is scarce round this island, and seldom taken. On St. George's Bank it is more frequent."

Captains Rose and Dodge, of the town of New Shoreham, have assured me, that according to their best estimation, having never used the balance, the numb-fish sometimes weighs as much as a hundred pounds, avoirdupois. The liver is the only part which the fishermen prize ; this organ they cut out, for its oil, and throw the body overboard.

2. *Occllated Ray.* (*Raja ocellata.*) With brown spotted and sharp prickly back.

One of these fishes that was thirty inches long, was nineteen wide. The shape rhomboidal.

Colour of the back ash or pale brown, spotted with black. Toward the posterior part of the flaps, a whitish mark on each side resembling a butterfly's wing. Occasionally several smaller ones of the same kind.

Upper surface over its principal extent, beset with prickles curved backward. These prickles are most frequent on the snout, near the eyes, and down the back to the end of the tail; with exceptions of a space on each side of the mid-back, that is nearly bare of them, and of a space down the back and tail, where there are none at all. The longest and strongest prickles are on the sides of the tail.

Lower surface smooth and white, without proper spots, but interspersed with a few black dots, and an appearance of slender lines here and there. Lower and hinder parts of the fins and tail ruddy.

Mouth broad, with teeth in both jaws like those of a file.

Tail thick and stout, with two fins on its upper side. Rays in the foremost difficult to be counted; in the hindmost amount to about nine. Both of these fins rough with small prickles. Under side of the tail, as well as the belly, entirely smooth, with a fringe or membrane on each side of the tail below the prickles.

Snout moderately projecting. Surface covered with a thick slime.

3. *Clear-nosed Ray.* (*Raja diaphanes.*) With semi-transparent rhomboidal snout, and roughness on its middle, and on the margin of the body toward the flaps.

The individual from which the present description is taken, measured two feet and three inches in length, by one foot and five inches in breadth.

Colour of the back light brown, marked irregularly with dusky, oblong, and roundish spots.

Belly spineless and white, with black dots and vascular branches here and there. A carnation or reddish tinge along the fins.

Middle of the snout rough; as is also the margin of the body toward the wings. A small patch of acute prickles incurved backward, laterally from the eye. A row of prickles reaching from the forepart of the back almost to the tail. Behind the anal fins, and at the root of the

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tail commence two other rows of prickles, one on each side, reaching quite to the extremity. A very trifling roughness, just sensible by the finger, under the snout. Orbits of the eyes jagged or spinous. All the remaining parts smooth and mucous.

A highly finished ciliated membrane covers the pupil of the eye.

The edges of all the fins are neatly fringed with white.

The snout which is lengthened toward an acute angle, is semi-transparent almost to the eyes; and its clearness allows a finger or a pen to be distinguished through it tolerably well, almost as high up as the eyes.

4. *Prickly-tailed Sting Ray.* (*Raja centroura.*) A very large species, found on the coast of Long-Island, with a tail of five feet or more in length, covered all over with prickly shields or scales, and armed on its upper side with two naked bones of four inches long inversely serrated.

Tail in Scudder's Museum.

5. *Cow-nosed Ray.* (*Raja bonasus.*) With a blunt snout resembling the nose of an ox.

This is a large species that visits the coast of New-York, usually about September, in numerous shoals. He enters the bays, and ranges very extensively the flats, where the soft clam (mya arenaria) lives. These shell-fish he is supposed to devour; for a shoal of cow-noses roots up the salt water flats as completely as a drove of hogs would do. I have seen the water in violent agitation when these fishes were at work in the bottom. They render it so muddy, that they are concealed from sight. Frequently, however, they rise to the top, and may be distinctly observed. I have seen them swim near the surface in clear water. They then support and propel themselves in their element, by their large flaps, as a crow or other bird, with slowly moving wings, passes through the air. They may be said to fly, rather than to swim.

They are detested by the people who live near the shores, by reason of the damage they do to the clams. Yet they are not employed for human food. When taken in seines they are usually left to putrify on the sands. Though sometimes the fishermen take out their livers for the purpose of conversion into oil.

A full grown individual of this species weighs about a hundred pounds.

CYCLOPTERUS. LUMP SUCKER.

Generic character.

Head obtuse. Teeth in the jaws. Tongue short and thick. Body thick without scales. Ventral fins united into a circle.

Blue Lump-fish. (*Cyclopterus cœruleus.*) With back and sides of a deep blue, thickly marked by small inky elevations; with a belly of a pea green and white; and with three rows of lumps or cartilaginous processes on each side.

The individual now before me was taken in the bay of New-York, with the shad, on the 11th of April, 1815. He was of a remarkably thick and chubby form. His length was nine inches; depth five and one half; and breadth four. He felt like a lump of gelatinous matter; and looked semi-transparent when held up to the light. But the skin was universally roughened by warts, or excrescences of different sizes.

There were irregular lumps of a cartilaginous kind, forming a ridge along his arched back; and which seemed to have taken the place of anterior dorsal rays. At the termination of this lumpy ridge, there was a broad step or stage, of about an inch long and an inch broad, whose sides were armed with similar elevations and lumps. Behind this, and along the descending curve of the back, was the dorsal fin, consisting of twelve broad and cartilaginous rays. I have since revised my description from a second fresh specimen, taken at the city of New-York, on the 4th of May.

There were three rows of lumps on each side. One proceeded from the eye-brow to the middle region of the tail. Another from the gill-opening above the pectoral fin to the lower part of the tail. A third formed the margin or angle of the belly, reaching from the extremities of the pectoral fin to the vicinity of the anal.

All these lumps, processes, and protuberances, bore a resemblance to the plates on the sides of sturgeons; but they were not so well defined, nor so hard and scabrous.

The belly was broad and flat; and at the forepart of it was an elliptical organ for adhering to other bodies. It was situated between the pectoral fins. The diameter was one inch transversely, by somewhat more than an inch longitudinally. It was surrounded by a fin or membrane; and there was an appearance of whitish bars across it, to the number of four.

The vent was distinct, about two thirds the way along the belly; and the anal fin was composed of ten soft and gristly rays.

The tail terminated straight and even; consisting of eleven similar rays.

The pectoral fins approached near toward each other, but did not quite unite. They consisted each of twenty rays.

The head was consolidated with the body. The mouth was an inch wide; and the teeth in both jaws were small and of a softish and yielding nature. The throat also contained some teeth. The eyes were very gibbous and prominent; the irides of a yellowish silvery; and their distances on the extremities of the head, two inches apart.

The branchia lmembrane consisted of four soft and cartilaginous rays.

The nostrils are two, and single; situated between the eyes; and ending in tubular orifices.

This animal possessed very little of a fishy odour.

SQUALUS. SHARK.

Generic character.

Mouth situated beneath the anterior part of the head ; with numerous teeth disposed in rows. Spiracles on each side of the neck, in most species five in number, of a semi-lunar shape. Body oblong, somewhat cylindric.

1. *Hammer-headed Shark.* (*Squalus zygæna.*) With broad transverse head, and eyes at the extremities.

The voracity of this animal may be judged of from the following occurrence at Sagharbour, in September, 1805 : "Three sharks of the shovel-nosed species were taken in a net by Mr. Joshua Terry, of Riverhead. The largest was eleven feet in length. On opening him many detached parts of a man were found in his belly. These were collected and buried. There was also found a striped cotton shirt patched on the sides and sleeves with bright striped pieces."

The specimen I have in a prepared state, was taken in the bay of New-York.

2. *Thresher, or Long-tailed Shark.* (*Squalus vulpes.*) With long and very unequal tail, almost smooth skin, and a single row of teeth.

An individual of this species was found, in 1803, on the south side of Long-Island, and described in the Medical Repository, vol. viii. p. 77. with a figure.

" The whole length of the body and tail was thirteen feet and one inch. The skin, though thick as that of the common shark, was not as rough, except a very little on the back. The colour was dusky or brown ; and the shades darker on the upperside than on the belly. The tail was stout and elastic. Its upper side was about three or four inches broad, and tapered away to an edge below. In this respect, it had some resemblance to the fin of a sea tortoise.

"The teeth were very sharp; about three fourths of an inch long, and formed but one row. The body was very cylindrically round, and possessed the great general features of the shark family."

3. *Long-toothed Sea Shark.* (*Squalus Americanus.*) With oblong sharp teeth, each of which has a little one on each side at its base.

This fish is occasionally taken at the very city of New-York. He, when he comes, frequents a certain place near the great market, on account of the dead fish and offal thrown into the water there. When the people see one of these sharks prowling about, they bait a hook with a piece of meat, or a fish, and not unfrequently catch him.

The teeth of this species are found abundantly in the alluvial country of North America. They are particularly met with in digging wells, near the Potomac and James river. On the former, they are found as high as Alexandria; and on the latter, in the city of Richmond itself. The long, sharp, narrow tooth, almost resembling a horse-shoe nail, with its two little auxiliaries at its base, is very plain and characteristic. This I know, by comparing the fossil Virginian species in my possession with those in the jaws of sharks taken at New-York.

The mouth of one that was killed during the summer of 1813 was nearer the snout than in many other species. Both jaws had five rows of teeth in front. They were nearly an inch long, and not jagged at the sides. Some of them have the rudiments of *two* little teeth, on each side, at the base.

4. *Green-backed Shark.* (*Squalus punctatus.*) With black dots round the snout and about the mouth.

Has nasal orifices on each side of the snout, on its lower parts, and forward of the eyes.

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Eyes on the side of the head, and wide apart. Their colour leaden, with silvery in concentric circles. Iris oblong and vertical, like cats, and other land animals of prey. The eyes seem more moveable in their sockets than is usual with fish.

Mouth wide and voracious. Teeth small, triangular, and without jagged edges. Arranged in rows, one in the upper, and two in the lower jaw. Tongue white and broad. That, and the palate, beset with a delicate roughness, meeting the finger when it is drawn over their surfaces from the throat toward the lips.

A row of excretory ducts runs along the upper lip, from one corner of the mouth to the other. Two other rows begin at the angle of the jaw, and run forward toward the nasal orifices, until they disappear and are lost amidst a great number of similar orifices, which distinguish the under side of the snout. These openings are blackish, and make a plain contrast with the whiteness of the skin. The sides and upper part of the snout are perforated with a plenty of similar holes. From them may be squeezed a mucilaginous fluid; evincing their function of supplying the skin with its slimy covering.

When this shark is in the water, his back and sides appear greenish. But soon after his exposure to air, and immediately after his death, the hue becomes a pale ash, leaden, or dove, with but trifling variegations. The parts about the mouth, neck, and belly, are of a clear white. The upper side of the pectoral fins, resembles the colour of the back; the lower partakes of the complexion of the belly.

The skin is free from scales, spines, and prickles; when stroked from head to tail it is remarkably smooth; when felt in the opposite direction there is a resistance so trifling, that it does not amount to a proper roughness.

Pectoral fins large, lunated, and strong. First dorsal stout and somewhat triangular, with a capacity, by means of a process behind, to be raised and lowered a little like a latteen sail. Situated about the middle of the back. The second dorsal membranous, somewhat adipose, and of a rhomboidal figure. Two ventral fins, with their parallel processes, conceal the anus. An anal fin corresponding to the second dorsal.

The caudal fin very unequally divided; the upper section being almost thrice as large as the lower, and having a process on the lower side.

The length of the individual from which this description is taken, was two feet nine inches. Breadth across from the tip of the pectoral fins, thirteen inches. Depth from the point of the dorsal, through the belly, nine. Girth, twelve and a half. Length of the longer division of the tail, eight. Is said to grow to two or three times this size.

Five lateral spiracles. Distance from the upper lip to the extremity of the nose, two inches and a half.

5. *White Shark.* (*Squalus carcharias.*) With snout somewhat blunt, and triangular serrated teeth.

Is sometimes caught within our waters; being supposed to follow vessels coming from sea.

The teeth are triangular, with jagged edges; and some of the points are a little awry, from the figure of an even or regular angle. They are commonly disposed in four rows, which are parallel, and which cover each other.

But on the subject of shark's teeth, I must observe, that they do not afford good characters to distinguish species; for I have now lying before me, the jaws of a shark killed at sea, and presented to me by a shipmaster, which contains both sorts of teeth, that is, the jagged and oblique triangular in the upper, and the oblong and sharp-pointed in the lower. But none of them have the minute side teeth which distinguished the the long-toothed shark, before described.

6. *Basking Shark.* (*Squalus maximus.*) Of a brownish lead colour above, whitish below, and small conic subulate very numerous teeth.

A shark of huge size, taken in considerable numbers near Province Town, Cape Cod, for the oil which his liver affords.

He is remarkable for having something within his mouth resembling the horny substance called *whale-bone*, which has led some persons to call him the *bone-shark*.

7. *Dog-fish.* (*Squalus canis.*) With small mouth, blunt teeth, the lower jaw shutting within the upper, and a tail almost straight.

Length, when full grown, four feet and more.

Colour leaden or ashen; rather dark on the snout and back, but pale on the sides, and white upon the belly. Neither spots, stripes, nor spines, on any part. Sometimes the fins are tinged with red; and the dorsals and caudal fringed behind with white.

Opening of the eye-lids oblong and horizontal. A nictitating membrane within the lower lid, capable of rising and excluding the light. Iris greenish yellow. Situation of the eyes, on the upper side of the head, half an inch or more from the edge of the snout. Immediately behind the eye, a hole or orifice, big enough to admit the end of a large probe.

Nostrils beneath the snout, capacious, with membranous covers and partitions.

Mouth small for a shark. Teeth blunt, and disposed after the manner of a file. The extremity of the lower jaw is toothed, and shuts within the teeth of the upper. Tongue white and scarcely rough.

Snout broad and blunt, but tapering rather toward a point, forward.

Two dorsal fins, of a somewhat triangular figure. The two ventrals, with their appendages, conceal the vent. Two anal fins, the foremost of which corresponds to the second dorsal, and the second is far back under the tail.

The tail is almost straight; that is to say, it is not arched upwards so much as in many of the sharks. Its upper side, extremity, and lower margin, are invested with one surrounding fin. The ash colour of this is sometimes relieved by a blush of red beneath, a fringe of white behind, and tinge of dark at the very tip.

The skin has no scales; but a scratching roughness when rubbed from tail to head. Yet when felt from head to tail, the skin is smooth.

There is a semblance of a lateral line, and indeed of two, a part of the way.

A row of excretory anals runs from the foremost gill-opening, toward the corner of the mouth. A great number more of these orifices on the lower side of the snout.

8. *Small blue Shark.* Grows to the length of four or five feet, and is often taken in our waters by the net, as he commonly bites off the line, if he is hooked.

It was on a female of this species of shark, that the observations were made which are inserted in the Medical Repository, vol. viii. p. 78. showing that the fœtus of this animal connects in the most remarkable manner, oviparous animals with viviparous.

PEGASUS. DRAGON-FISH.

Generic character.

Snout elongated. Mouth beneath. Pectoral fins large. Ventral single rayed. Body depressed, mailed, and abdomen divided into bony segments.

Pegasus volans. (*Flying pegasus.*) The specimen I have of this singular fish, is from China; yet I deem it proper to mention him here. In the jointed form of the body he resembles the syngnathus. In the expanse of his wings he is allied to the exocœtus and trigla. He is a small fish not more than three inches long; and has a pointed snout rough at the edges.

AFTER all I have done on the subject of our ichthyology, I well know that many species remain unnoticed. Some of these I am acquainted with as a sportsman, though I have not as yet been able to examine them as a naturalist. Of others, I have the accounts stated to me by respectable observers, who are not zoölogists. I cannot entertain a doubt that there are various kinds which I have neither seen nor heard of. I have reason to believe that the *cyprinus* or carp family, the *esox* or pike, and the *salmo* or trout, will be found to comprehend a considerable number of new sorts. When these shall come to hand, they may be described and arranged in the form of a supplement to the present memoir. And if at any future day, I should republish it in a distinct and separate tract, all the additional articles may be disposed in the places to which they respectively belong. I expect additional species to the genera of *squalus* and *raja*.

Important discoveries may be anticipated from the waters of the interior country, and especially from the lakes. For the person who shall be enabled to explore those regions, in a proper manner, there will be abundant employment, and a naturalist's reward.

I AVAIL myself of this opportunity to mention with respect, a Sicilian naturalist, who formerly resided in the United States, I mean Mr. C. S. RAFINESQUE SCHMALTZ, whose botanical contributions have repeatedly enriched the pages of the Medical Repository. Since his removal from Philadelphia to Palermo, he has published, among other works, in the Italian tongue, a tract entitled, *Caratteri di alcuni nuovi generi et nuove specie di animali e piante delle Sicilia con varie osservationi sopra i medesimi*; that is, characters of some new genera, and species of Sicilian animals and plants, accompanied with various observations. He has paid particular attention to the fishes in the Mediterranean, near the place of his residence; and has given figures and descriptions of fifty-nine species, which appear to him to have been overlooked by former writers.

It would scarcely seem possible, that so great a number of fishes, inhabiting that sea, should have remained unknown until the year 1810; and that the book, containing the plates, with the generic and specific marks of each, should have been so little noticed.

I take pleasure, as it lies before me, in giving a brief account of this able, though neglected performance. Immediately on his arrival at Palermo, he found there was much employment for a naturalist, in all the departments. Minerals, vegetables, and animals, each stood in need of illustration. For five years he employed himself with the greatest industry, in making journeys and excursions, and in procuring facts and specimens. The new information was so considerable and important, that he meditated an improved edition of CUPANI's *Panphyton Siculum*, which was confined to plants, and converting it into a *Panphysis Sicula* that should embrace every sort of natural knowledge. He, however, abandoned that project, and determined to publish his zoölogical and botanical discoveries by themselves. It would hardly be expected, yet he declares it to be true, that he has discovered among the cetaceous animals, birds, amphibia, and fish, one hundred and seventy-eight new species, out of which he has found it necessary to constitute fifty-one new genera. A. B. Bernardi, one of the secretaries of state, has the honour of the dedication; and Mr. S. promises soon to publish his discoveries among the vermes, molluscas, testacea, crustacea, and insects of Sicily. In all these enterprises, I heartily wish him both emolument and fame.

WHILE engaged in this performance, I have endeavoured to innovate as little as possible, upon established system, by the erection of new genera. I have, nevertheless, been obliged to constitute a family under the order of thoracici, to receive and accomodate a fish, for whom I could not otherwise find a place in the class.

CENTRONOTUS. CRAB-EATER.

Generic Character.

Head broad and smooth. Under jaw projects beyond the other. Eight spines in front of the dorsal fin. Lower division of the tail shorter than the upper. Lateral line somewhat waving, and entering the caudal fin. Eyes far apart.

Crab-eater. (*Centronotus spinosus.*) With dusky back, silver-white sides, and milk-white belly.

The specimen now before me was bought in the New-York market, June 11th, 1815. The length was thirty-one inches; breadth four; and girth eleven. The weight was rather more than six pounds and a half. He had been catched in the bay a few hours before.

The halut and complexion at first glance, resembled, faintly, that of the big oceanic sucker; (echeneis neucrates;) but the difference was very perceptible on examination. The head was broad, flat, and smooth.

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Not a knob, spine, or cirrhus, either on it, or on the chin or gill-covers. There were eight stout spines about a quarter of an inch long, and half an inch apart on the top of the back, in front of the dorsal fin. The form was such, that between the pectoral fins, the horizontal diameter was greatest ; yet altered so that at the commencement of the dorsal fin, the perpendicular diameter was most considerable. From this part, the body tapered away gently to the tail, which was lunated unequally, the upper segment being rather longer than the lower, and the distance between their extremities being about seven inches.

The dorsal fin began immediately behind the last of the before-mentioned spines, or a foot from the snout ; and it reached about the same distance toward the tail. The vent was nearly midway between the extremities ; and the anal fin reached about eight inches beyond it. Both the dorsal and anal ceased before they reached the tail.

The upper jaw was bluntly rounded. The lower jutted beyond the upper ; was rather lengthened, and less blunt. Both had distinct lips. The teeth were small, and resembled graters by their roughness. Gape of the mouth wide, and throat capacious. Both lips roughened by minute teeth. Three patches of teeth in the palate. Tongue broad, reddish, and in the middle cartilaginous, with an array of teeth upon it. Four pair of roundish cartilaginous patches, near the junction of the branchial arches, between the tongue and throat. In the throat itself, just in front of the gullet, two toothed patches above, and as many below. On these, the teeth rather longer and sharper than the rest.

The eyes were vertical on the sides of the head, and as much as three inches apart. Their colour whitish, with a tinge of yellow. About an inch in front of them, patulous double nostrils.

The general colour of the head, back, and tail, dorsal and caudal fins, dark brown, almost approaching to black. The inside of the pectorals of the same hue ; the outside a dirty white. Behind the pectorals commenced a silvery riband about an inch and a half wide, and extended to the tail. The chin, gill membrane, neck, belly, and lower sides of the ventral fins, excepting these tips, a milk white. The upper sides of the ventrals, which close to the body, dusky; and their extremities of the same complexion on both sides. The pectoral fins are pointed. Behind them, a black horizontal line or seam, two inches long.

The first five or six rays of the dorsal and anal fins, considerably longer than the rest. The ventrals are small, and situated very near each other.

The skin is covered with small adhering scales.

The lateral line runs from the upper part of the gill-opening, rising a little, and meandering a little, quite into the caudal fin, but terminates before it reaches the end of the tail.

The rays in the fins are all soft, and in some of them difficult to be numbered; but as nearly as they can be ascertained, they are as follows, viz.

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On dissecting this fish, the most remarkable occurrence was the stomach distended with food, consisting of twenty spotted sand-crabs that were entire enough to be counted, and several young flounders.

This fish was boiled and served up at my table; on which occasion my family, servants and all, had but one opinion, that it was one of the best we had ever eaten.

⁂ THERE are some dates more recent than the reading of the memoir. These refer to certain articles which came to my knowledge since the paper was presented, and which it seemed improper to exclude.

MITCHILL'S FISHES OF NEW-YORK. Pl. I.

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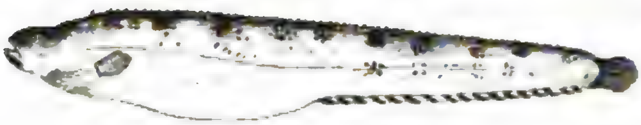

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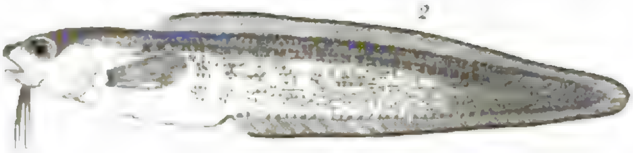

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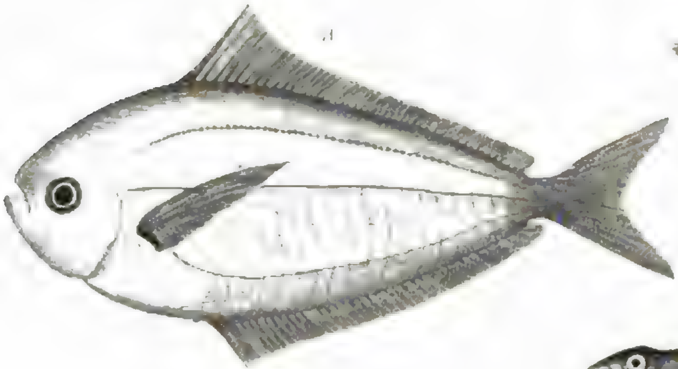

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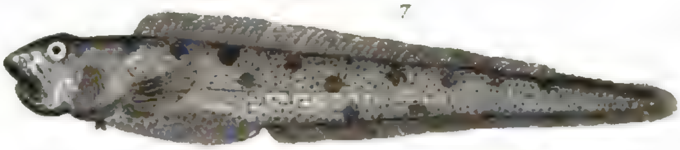

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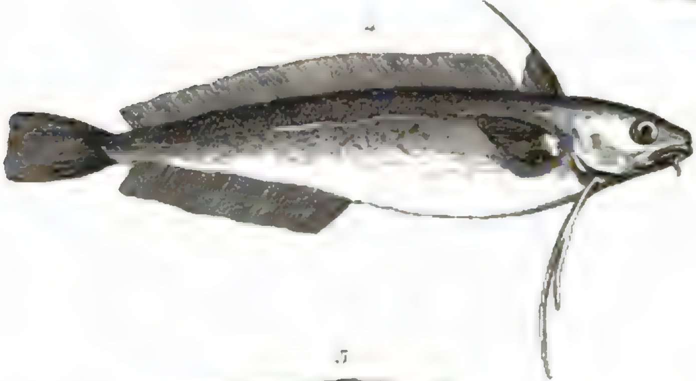

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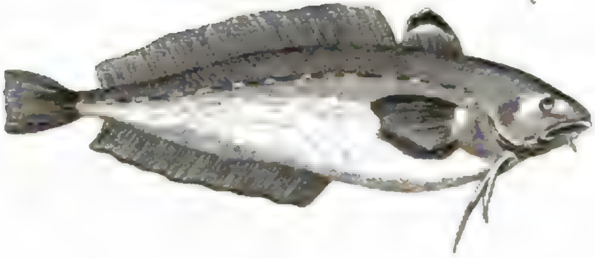

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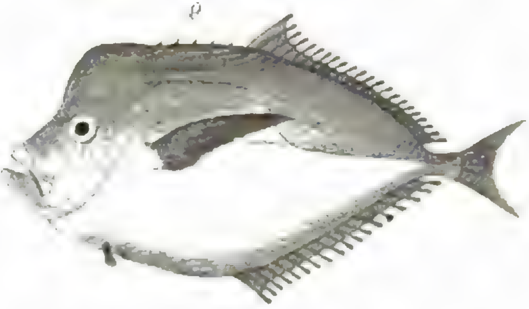

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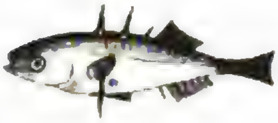

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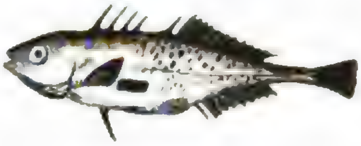

1. *Spinous Ophidium.*
2. *Cirrhous Ophidium.*
3. *Cryptous Broadshiner.*
4. *Codling.*
5. *Dotted Cod.*
6. *Fringed Blenny.*
7. *Large-lipped Blenny.*
8. *Variegated Goby.*
9. *Bristly Dory.*
10. *Two-spined Stickleback.*
11. *Four-spined Stickleback.*

A. Anderson sc.

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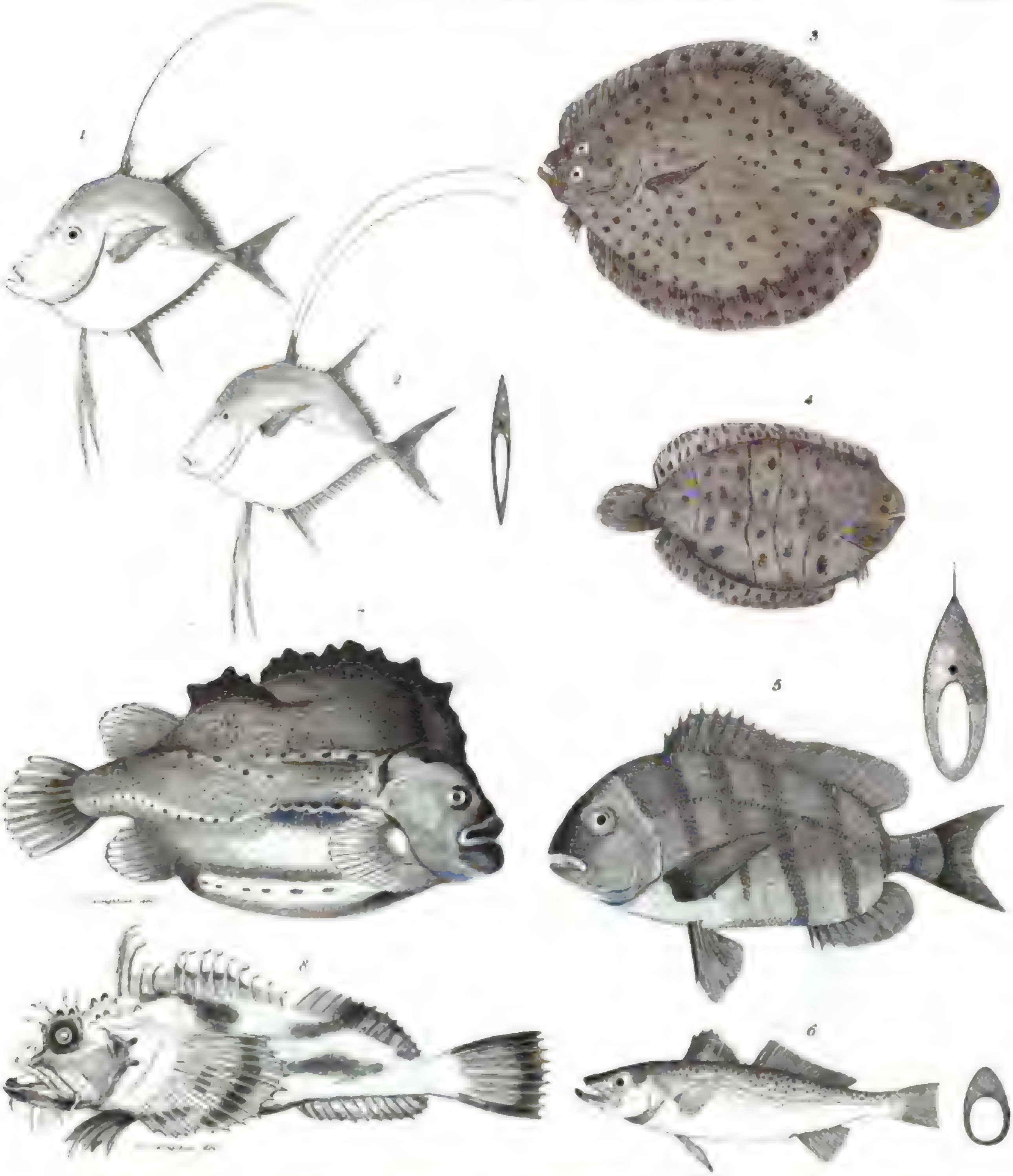

1. Rostrated Dory.	*3. Plaice of New-York.*	*5. Sheepshead.*	*7. Blue Lumpfish.*
2. Hair-finned Dory.	*4. New-York Sole.*	*6. Weakfish.*	*8. Yellow Scorpæna.*

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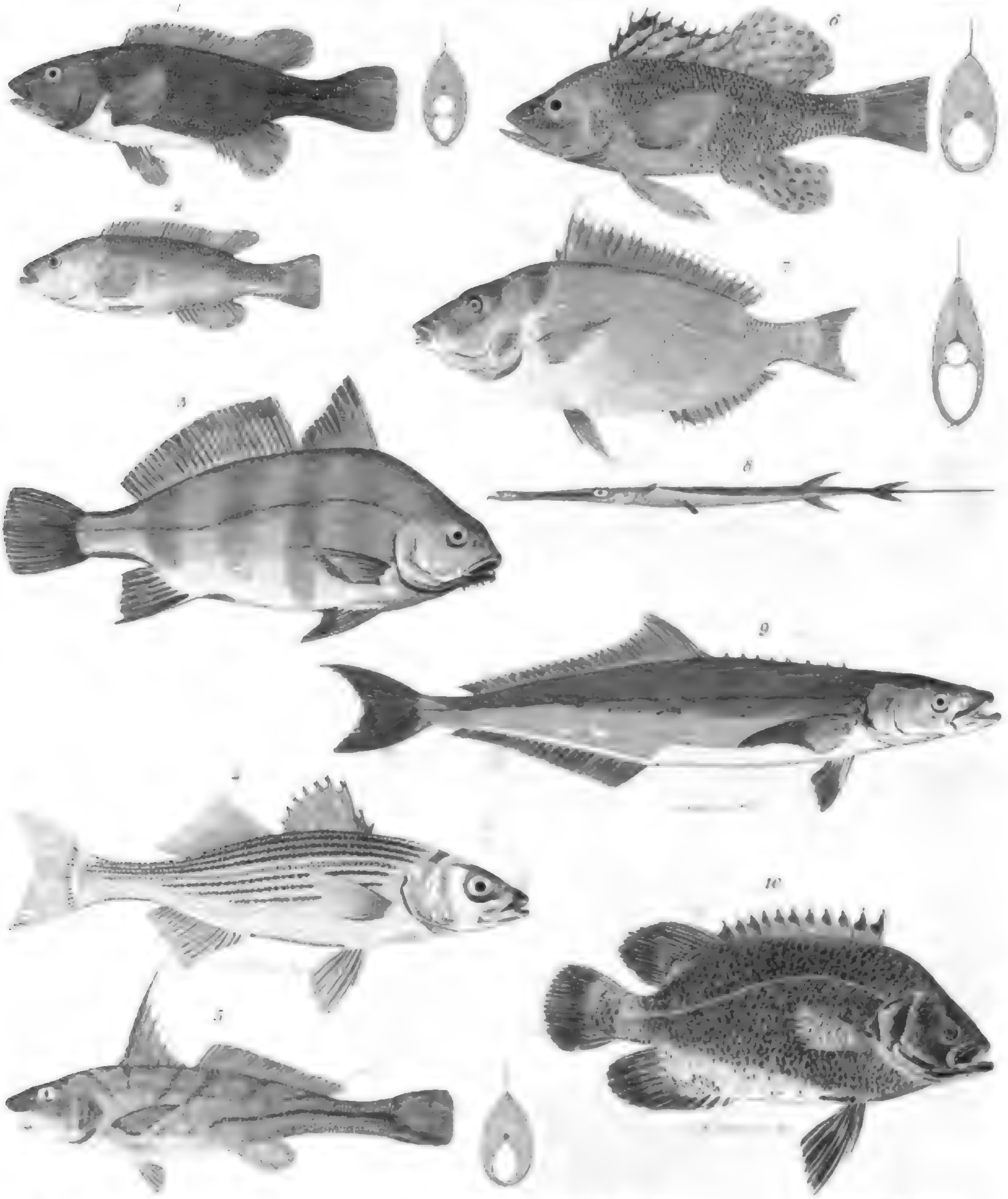
MITCHILL'S FISHES OF NEW-YORK.

Pl. III.



1. Blackfish or Tautog.
2. Bergall or Chogset.
3. Grunts or Young Drum.
4. Striped Basse or Rockfish.
5. King-fish.
6. Sea Basse or Black Harry.
7. Big Porgy.
8. New-York Trumpet-fish.
9. Centronotus or Crabeater.
10. Triple tailed or Black Perch.

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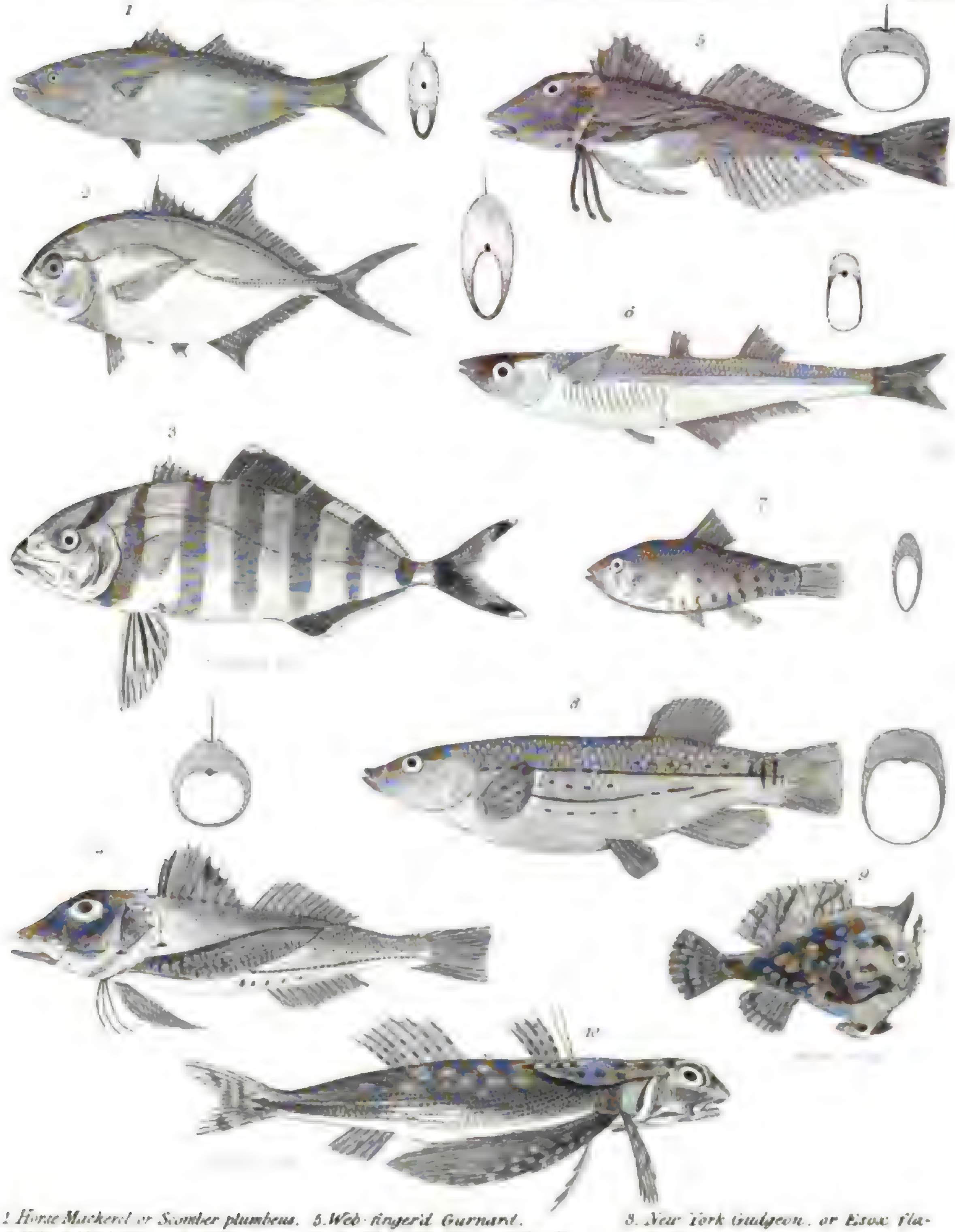
MITCHILL'S FISHES OF NEW-YORK. Pl.IV.



1. Horse Mackerel or Scomber plumbeus.
2. Yellow Mackerel, or S. Chrysos.
3. Banded Mackerel or S. zonatus.
4. Sea Robin, or Trigla lineata.
5. Web-fingerid Gurnard.
6. Small Silverside, or Atherina notata.
7. Sheepshead Killefish or Esox ovinus.
8. New York Gudgeon, or Esox flavulus.
9. Mouse fish, or Lophius Gibbus.
10. Six rayed Polyneme.

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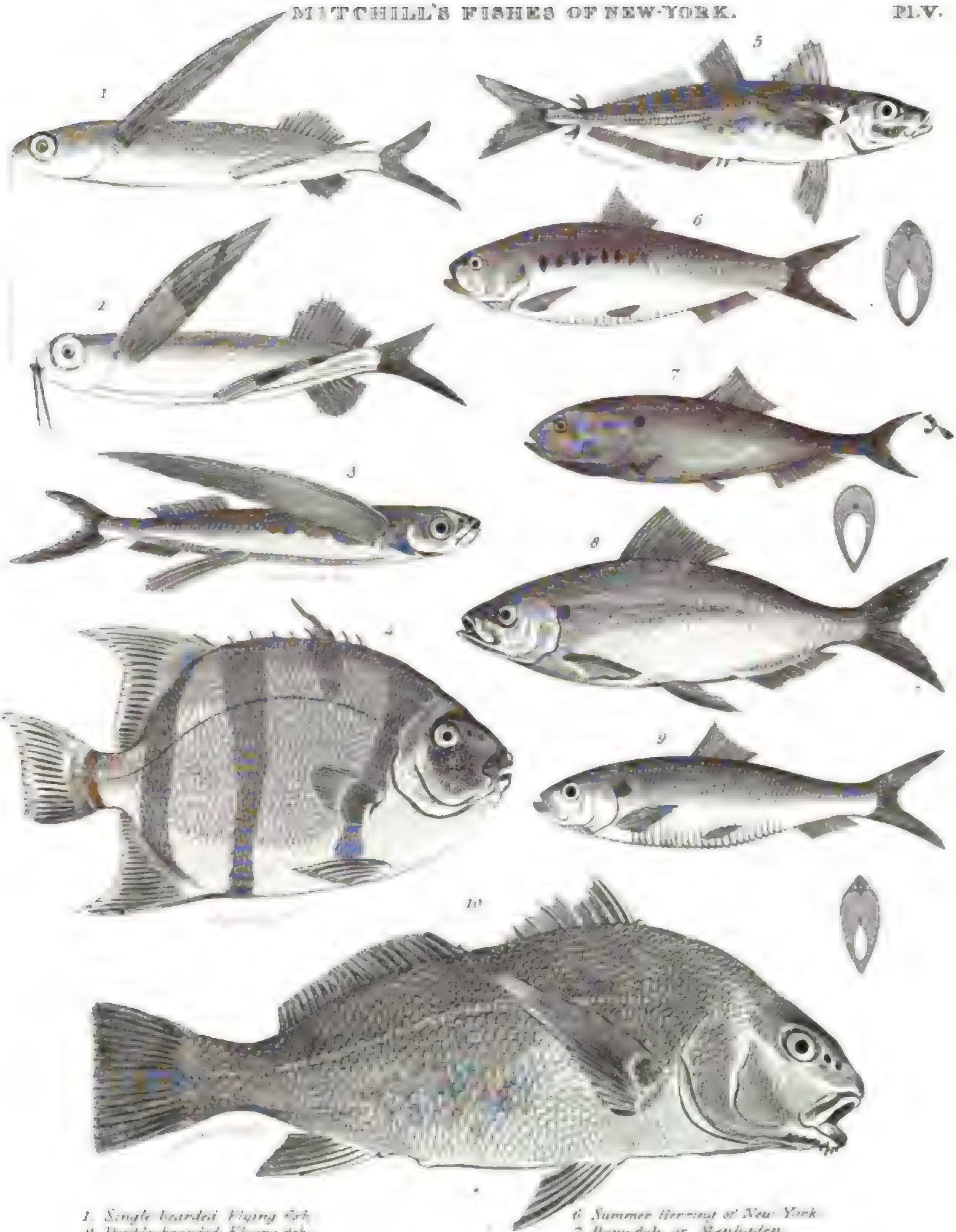

1. *Single bearded Flying fish.*
2. *Double bearded Flying fish.*
3. *New-York Flying fish.*
4. *Cloudy Chætodon.*
5. *Hippos Mackerel.*
6. *Summer Herring of New-York.*
7. *Bony fish or Menhaden.*
8. *Fall Herring or Long-Island Herring.*
9. *Spring Herring or Alewife of New-York.*
10. *Red Drum or Sciæna Gigas.*

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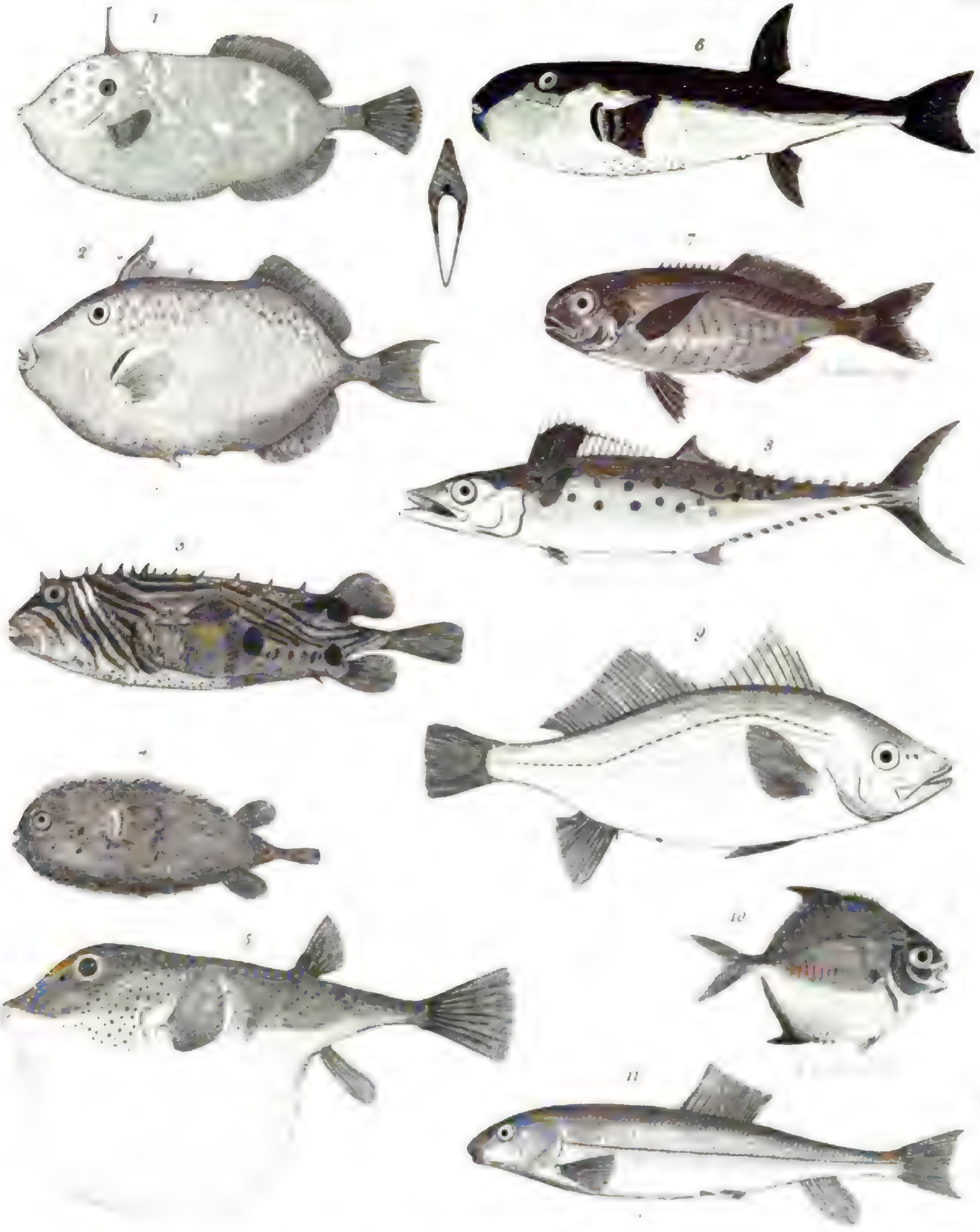
MITCHILL'S FISHES OF NEW-YORK.

Pl.VI.



1. *Orange Balistes.*
2. *Trigger-fish. Balistes.*
3. *Spot striped Diodon.*
4. *Hairy Diodon.*
5. *Puffer or Toad-fish. Tetrodon.*
6. *Mathematical Tetrodon.*
7. *Rudder fish or perch Coryphene.*
8. *Spanish Mackerel.*
9. *Silvery Perch.*
10. *Spinous Dory.*
11. *Fresh water Sucker or Cyprinus teres.*

J. Anderson Sc.

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VI.

SOME REMARKS *on the* FISHES *of the* WESTERN WATERS *of the State of New-York, in a letter to* S. L. MITCHILL, M. D. &c. *from the Hon.* DE WITT CLINTON, LL. D. *Member of the American Philosophical Society, President of the Literary and Philosophical Society of New-York, &c. dated New-York, February 1st,* 1815.

[Read before the Society, on the 9th of February, 1815.]

SIR,

YOUR meritorious attempts to elucidate the ichthyology of this country, have attracted the attention, and excited the expectations, of the public. "Unto whomsoever much is given, of him shall be much required," is the language of holy writ. What the Michaux have done to illustrate our botany, and Wilson our ornithology, will, no doubt, be effected by you, in the great department of natural science which you have undertaken. What vast treasures of natural knowledge remain to be discovered in this country! Let us hope that these immense fields of interesting investigation will, in due time, be fully explored by the eagle eye of philosophy.

In abundance, in variety, and in delicacy, the fishes of our western waters are not surpassed by any in the world. They ought to be fully examined, and I need not tell you, that little or nothing has been done in this way. The few scattering and desultory notices we have of them, have been principally furnished by strangers to natural knowledge. With a view of drawing your particular attention to this subject, I have taken the liberty of addressing to you a few observations, which either occurred to me during a short visit to that country, or which have since been suggested by intelligent gentlemen with better opportunities for information.

In the first place, there is a marked distinction between the waters above and below the cataract of Niagara, in respect to certain species of fishes. That wonder of nature interposes an insurmountable barrier against the ascent of fishes: The salmon and the eel are never seen above the Niagara Falls, and it is probable that there are some fishes in the upper lakes which are not to be found in the waters below the cataract.

Secondly, it may be asked, how then did fishes get into the upper lakes? This is susceptible of a satisfactory answer: It may have been accomplished in three ways.

1. When, after the submersion of the whole earth by the general deluge, the ocean retreated, and dry land was formed, fishes would, of course, be left in the waters that remained; and as lakes, which have outlets as well as inlets, like our great western lakes, would in process of time, lose their saline qualities and become fresh, their inhabitants would either accommodate themselves to this new situation, or gradually become extinct.

2. In every spring and fall there is a communication between the lakes and the ocean, by means of the Chicago, Illinois, and Mississippi, and it is highly probable that this is the route of some kinds of fishes from the ocean. The carp, chub, sturgeon, pike, and cat fish of the Mississippi, are to be seen in the lakes and their tributary streams. There is, certainly, a great resemblance between some of the fishes of the ocean and of the lakes, and this similarity has been traced to such a fanciful extent, that a very ill-tasted fish in Erie, is called the *sheep's head*, on account of a supposed resemblance to its salt water namesake. The salmon does not pass by this route into the lakes, because he never visits the

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Mississippi, and the eel does not avail himself of it, because his habits are directly the reverse of all fishes that ascend from the sea into fresh water rivers. They pass into rivers for the purpose of propagation, and in course of time their brood go to the ocean, where they acquire their growth. On the contrary, he visits the sea every autumn with the same view, where he produces his young, and the ensuing spring they ascend into the rivers. As it is near two thousand miles from the lakes to the Gulf of Mexico, these periodical and semi-annual voyages, are impracticable: and it is certainly almost impossible for the young eels to proceed to such a distance against the rapid currents of the Mississippi and Illinois.

3. Fishes are found in small ponds and lakes which have no communication with any other waters. This is, perhaps, generally accomplished by aquatic birds who swallow the ova of fishes, and carry them to other places. They may have been conveyed in like manner to our inland fresh water seas.

At the head of the western fishes, may be placed the *white fish*, which is universally admitted to be the most delicious. When I visited that section of the country, I had no opportunity of seeing this celebrated fish. We are even ignorant of the family to which it belongs, and it is not known to us by any specific marks. From the general account which I have had of its form and habitudes, I am induced to believe, that it belongs to the salmo genus, and that it is a non-descript. It is found not only in all our great lakes, but it exists also in the lakes and rivers to the north west of them. It is described as a white straight fish, not unlike salmon in appearance, but very different in taste; about the size of a shad, but thicker and less bony, and generally weighing from three to six pounds: It abounds at the falls of St. Mary's, and is taken in great numbers, in the spring, in the mouth of the Niagara river, and even as high up as Lewiston: It is caught by sweeping the beach with a seine;

but owing to the declivity in Niagara river from Lewiston to the fort, there is no advantageous position to draw the seine, except on the beach between Fort George and the Light House, on the British side, where it is practised with great success.

Pike or pickerel, weighing from three to twelve pounds, are taken in great numbers in the lakes, and as high up as the whirlpool, in the Niagara river; their bodies are long, and nearly round; their flesh somewhat soft, but fat, and much esteemed when boiled; they are not good when dried or salted.

The muscalinga, a species of pike, is greatly esteemed, and is generally caught in rivers emptying into the lakes: It weighs from ten to forty pounds, and in a few instances forty-five pounds, and is generally very fat.

The salmon-trout, and cat fish, are also excellent, and are not usually as large as the muscalinga; but some of the first have weighed fifty pounds.

The sturgeon is an inhabitant of all the lakes, and has been caught, I am told, weighing more than one hundred pounds. Its flesh is of a firmer and finer structure than those taken in the Hudson.

White, black, and rock basse, are also seen in great numbers. The first is said to resemble the sea basse; the second, the black fish; and the third, the rock or streaked basse of the ocean. They are all much liked, generally weighing from one to three pounds, and are good salted or dried: It affords fine amusement to trail for the black or Oswego basse, when passing over the Oneida lake: Even when the boat is in full motion, they bite with avidity at a red rag tied to a hook.

Although the eel cannot ascend the Niagara falls, yet it is continually making attempts, and is sometimes found as high up as fifty feet, and is often taken under the falls, where it inhabits the grass growing among the rocks that are usually covered with spray.

An intelligent gentleman, who has resided many years in the vicinity of the lakes, estimates that there are one hundred and fifty species of fishes in these waters: Admitting that this estimate is too high, yet it shows the extensive range of inquiry which this subject opens.

The principal fishes, on account of their number, delicacy, and size, belong to the salmo, accipenser, perca, esox, and ciprinus genera.

Father Hennepin, who ascended the Niagara river in 1698, states, that there were fishes enough in that river, of different kinds, to supply the greatest city of Europe. And the reason assigned by him is, that they continually swim up from the sea toward the spring of the river, for fresh water, and that the infinite number that take pleasure to come and refresh themselves in those waters, continue there, because they are stopped by the cataract. Notwithstanding these allurements, and the almost universal spread of the salmon over all the western waters, below the cataract of Niagara, it is not seen in the river of that name.

Dr. Barton, in his able discourse on some of the principal desiderata in natural history, &c. read before the Philadelphia Linnæan Society in 1807, asks, "What is the theory of the well-ascertained fact, that although the salmons abound in Ontario, and in many of the waters which empty into this great lake, they have never been known to penetrate up the Niagara river, even as far as Queenston, although there is nothing to obstruct their passage, for near nine miles higher up the stream? Have they learned by a kind of tradition, that the cataract opposes an insurmountable barrier to their migration beyond a certain distance? Is it the noise of the falls, propagated along the course of the Niagara river, that deters the fish from moving upward? Perhaps we shall discover the solution of the fact in a difference of the temperature of the waters of the Ontario, and those of the Niagara river, or in some peculiarity of impregnation of the waters." And in a note annexed, he says, "Some persons with whom I have conversed on the subject, have assured me that the salmon has never been seen or caught in any part of the Niagara river; but this, I believe, is not a correct statement." Upon the whole, he thinks it most probable, that it is the noise of the cataract of Niagara which deters them from passing up the river as far as that bound, beyond which they could not pass.

Although I entertain the utmost confidence in Dr. Barton's accuracy, yet as the remoteness of his residence might have exposed him to imposition, I thought it advisable to ascertain the fact before I speculated on its causes. I accordingly addressed a letter to an intelligent friend, who has resided a long time near the Niagara river, and who now lives at Buffalo; and in his answer, dated 17th January, 1815, he says, "Salmon, from what I can learn, have not been known to ascend Niagara river, or even to appear at its mouth. There is no evidence of their having been caught nearer than the mouth of Oak Orchard Creek, on the American side, about thirty-five miles from fort Niagara; and Stoney and Forty-mile creeks, in upper Canada, a distance of about forty miles from said fort; but the principal place of taking them is at the head of lake Ontario. A number of people, before the war, followed it as a livelihood. They became an article of exportation."

It is not probable that the salmon would be terrified by the noise of the cataract, from ascending the river. We know that the falls of Oswego, and the salmon-leaps of Europe, have no such effect; and, indeed, if it be true that they keep at the distance of thirty or forty miles from the mouth of the river, this supposed cause must be entirely inoperative: Besides, it is about fifteen miles from the cataract to the place where the river discharges itself into the lake, and therefore it cannot be supposed that the noise would have any terrifying effect at such a distance.

At Lewiston the Niagara is about a quarter of a mile wide; from

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thence to its outlet is near eight miles: Its depth varies from forty to one hundred feet; its colour is a beautiful sea green, and its current descends at the rate of three miles an hour. The banks of the river are precipitous, and are principally formed of a stone composed of indurated red clay, which is friable on exposure to heat or frost. I at first supposed that the washings of this red substance into the river, might have communicated qualities to the water disagreeable to the salmon, but I have little confidence in this surmise. This fish ascends into Wood Creek, which is generally a muddy, impure stream, and it abounds in Fish Creek, which discharges itself into Wood Creek, about a mile from the Oneida Lake. Vast numbers are taken in that lake, and it is well known that its waters are saturated with dark atoms, which render them insalubrious, and when drank, operate emetically, and produce fever. The boatmen call this substance the *lake blossom*, and as it is no where else, the cause must be local. Whether it proceeds from the farina of trees, the ova of insects, or collections of animalculæ, I could not determine from a scrutinizing examination with a microscope; but I am inclined to believe, that it is conveyed into the lake by the waters of Wood Creek, from rotten trees, and from the vegetable putrefactions produced in the swamps and marshes through which that stream runs: At the time that this unwholesome and pernicious substance abounds in the lake, salmon are caught in great plenty: and if they ascend into this insalubrious collection of waters, there can be nothing to prevent their visits to Niagara river. In Gmelin's edition of the Systema Naturæ, the salmon family are described "as impatient of foul water, and as generally found in rapid rivers. A few of them inhabit the sea, but get into rivers once a year for the purpose of depositing their spawn in beds of gravel; for which purpose they will surmount many difficulties, and force themselves against the most rapid streams. After spawning they return to the sea, poor and lean. They feed on other fish, and the flesh of all the species is excellent."

The salmo salar makes its appearance in lake Oneida, in May, and continues until winter. It is said to eat nothing during its residence there. By a statute of this state, the taking of salmon in October and November, in Fish or Wood Creek, by net, hook, or spear, or any other device whatever, is prohibited: this provision was probably designed to protect the young brood. The Indians take this fish by spears: In the night time they fix pine lights in their canoes, and traverse the lake for the purpose. The number of canoes, and the various and brilliant lights on the waters, exhibit a most beautiful and picturesque appearance.

But to return from this digression: I believe it may be laid down as an incontrovertible truth, that the principal cause of the ascent of fishes into fresh water, from the ocean, is for the purpose of spawning. Along the borders of the favourite rivers of the salmon, are to be seen collections of gravel in a conical shape, where that fish deposites its spawn; and this is also the case in streams resorted to by it in Europe. In order to allure this fish, the rivers must be shallow near their margin, and they must also contain gravel and sand, suitable for the erection of those places of deposite. Niagara river is destitute of these accommodations, and, of course, the salmon does not resort to it for the purpose of propagation.

It is believed, by many well-informed naturalists, that anadromous fishes invariably resort, in their periodical migrations, to the waters where they are produced. It is said that young salmons, in England, have been caught, marked, and set at liberty; and that, during the next season, they have been again taken in the same rivers, and have been identified by the same marks. Shaw, in his Zoölogy, (vol. v. p. 40.) says, "The salmon, like the swallow, is said to return, each season, to the self-same spot to deposite its spawn. This has been ascertained by the experiments of M. De la Lande, who, fastening a small ring of copper to the tails of some individuals, and then setting them at liberty, found that some of them made their appearance in the same place, for three succeeding seasons." If this be the case, you will at once perceive why they do not visit the Niagara, a river where they have never been propagated.

VII.

FACTS *respecting the* ROCK FISH, *or* STREAKED BASSE, *of the United States. By* JAMES MEASE, M. D. &c. *of Philadelphia. Communicated in a letter to* DAVID HOSACK, M. D. &c. *dated Philadelphia, June* 23, 1815.

[Read before the Society, on the 13th of July, 1815.]

THE fishing ground for rock fish, destined for the Philadelphia and New-York markets, is between Long Branch, on the coast of Monmouth county, New-Jersey, and Cranberry Inlet, and extends about thirty miles in a line; but they are caught from Sandy-Hook to the Capes of Delaware. They make their appearance about the first of September, and in large shoals. Two thousand pounds weight have been caught in one haul of the seine. They keep along shore, between the outer bar and the beach. In the month of November, or in the beginning of December, if the weather continue mild, they leave the sea, and, in company with the common American perch,* run into the rivers along the coast, to pass the winter, stopping or resting, in various places as they ascend, for a day or two at a time, and thus gradually proceed to the head of the rivers, where they remain, unless disturbed, until the following spring. Many of them ascend as high as the depth of water will permit them, and lie among the bushes growing in the water, or that may have fallen therein. Sometimes, however, owing to violent rains, or to the sudden melting of snow, or an unusual quantity of water descending the rivers, the fish are forced from their abode back again to the salt water, and remain there until the freshes subside, when they invariably reascend. The great places of winter resort for those fish are, Motetecunk, thirty miles from Long Branch, and the rivers of Elk and Egg-Harbour.

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* Bodianus Pallidus? of Mitchill.

During the time that those rivers continue frozen, the fish are caught by sinking nets through holes cut in the ice: and in the spring of the year, they are sometimes taken in great numbers, by stretching a net across those streams which are too shallow to permit the seine to be drawn in the usual way, and then sweeping the stream from above with bushes connected together, so as to extend from one bank to the other. This practice is, however, justly reprobated as a species of poaching, dishonourable, and highly injurious to the fishing business; and one instance was mentioned to me of a creek being completely exhausted of fish ever since the first avaricious haul was made in it: this haul was made seven years ago. The stream alluded to is Beaver-dam Creek, that empties over the head of Squam Bay, north of Motetecunk, and, previously to the date mentioned, was noted as one of the constant places of resort for rock-fish and perch, during the winter.

The largest rock-fish, that is, those that weigh from twenty-five pounds to sixty pounds, are called *green heads*, and do not ascend the rivers, but remain at sea all winter, and spring, until about the middle of May, when they come into the bays of Delaware and New-York, to spawn. In the Deleware bay they never ascend higher than where the salt water meets the fresh. At that season they are remarked to be unusually fat, but the males are fatter than the females. The roes of some of them weigh ten pounds. The intelligent fisherman from whom the foregoing facts were obtained, is of opinion, that there are barren fish among those large kinds; for he has repeatedly opened them in the spring, without finding either roes or milts. The linea lateralis, and the scales of the rock-fish, caught in salt water, are constantly found darker than those of the same fish caught in fresh water.

VIII.

CASES OF MORBID ANATOMY.——1. HISTORY *of a Case of* DISEASED ŒSOPHAGUS, *with a detail of the Morbid Appearances of that and of other parts of the body; with Remarks. By* JOHN W. FRANCIS, M. D. *Member of the Massachusetts Historical Society; Professor of Materia Medica in the University of the State of New-York, &c.*

[Read before the Society, on the 8th of June, 1815.]

THE information which morbid anatomy supplies is always interesting, frequently important, and may be considered in every instance indispensable, where a complete acquaintance with the exact nature and seat of disease is required. The following case, inasmuch as it exhibits no ordinary example of the great and various changes of structure which the body may undergo, during the predominance of the vital functions, seems to be calculated to augment the stock of physiological and pathological knowledge, if not to enlarge the sanative powers of medical science. The details of the case have been compressed as much as was deemed expedient: less minuteness might have prevented the forming an opinion, how far the symptoms corresponded with the appearances ascertained by dissection.

J**** S********, fifty years of age, a native of Dumfries, in Scotland, of a habit of body rather delicate, and of the melancholic temperament, on the morning of the third day of September, 1814, while attempting to take his ordinary breakfast, found himself incapable of swallowing, and that the efforts which he made to get even small quantities of food into the stomach gave him severe pain. He referred to the gastric region as the seat of part of the distress which he suffered, and more particularly to a circumscribed spot above the pit of the stomach, under the breast bone. Under those circumstances medical aid was deemed necessary, and he requested the attendance of Doctor David Hosack.

The patient is wholly at a loss to assign any cause for the existence of the alarming complaint under which he labours. He arrived in this country in the year 1796, and, with the exception of occasional slight attacks of cold affecting his chest, his constitution, previous to the year 1798, had never been impaired by disease, and he had uniformly enjoyed excellent health. He was accustomed to the promiscuous use of animal and vegetable diet, and his digestive powers were vigorous. In the summer of 1798, during the prevalence of the malignant yellow fever, in this city, he contracted this febrile disease, from which he with great difficulty recovered. In his case, the yellow fever exhibited its most striking characteristic symptoms; and the affection of his stomach was so severe, that he laboured under the black vomit and hiccup for many days: the black vomit, which was similar in its appearance to coffee grounds, was arrested by the free use of lime water and milk, and lime water and porter; then a novel mode of treating this distressing symptom, and first introduced by Dr. Hosack. Since that time the patient has not enjoyed his wonted share of health; though he resumed, and, with scarcely any intermission, continued engaged in his professional business, that of a blacksmith, his constitution he represented to be more nervous than formerly. On account of inattention to dress, and exposure to cold, he has also, since that period, suffered repeatedly and severely, from inflammatory affections of his chest; and in 1809 he had an attack of hæmoptysis, from which he lost a considerable quantity

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of blood. In 1812 he fractured one of the ribs of his left side. In the winter of 1813—4, he again laboured under a severe pneumonic affection, but had not recourse to medical advice. His susceptibility to inflammatory diseases of the thoracic viscera being increased, and his professional employment exposing him to sudden changes of heat and cold, he, from this period to the time of his present illness, frequently suffered from attacks of pneumonia, and as often neglected the means of relief.

The weak condition of his digestive organs, which was first occasioned by the yellow fever of 1798, was often made manifest, more particularly for the last ten years of his life. He was frequently reduced to the necessity of rejecting the contents of his stomach immediately after eating either animal or vegetable food; and fish, though prepared in the most delicate manner, and taken in very small quantity, was so obnoxious to him as to cause excessive vomiting. For the last two years there has been an increase both in the frequency and in the severity of the disorder of his gastric region: the assimilating powers of the stomach being much impaired, he often complained of headach, heart-burn, flatulence, and other symptoms of dyspepsia, with a costive state of his intestinal canal. During the early part of the summer of 1814, he at times stated to his friends, that he found considerable difficulty in swallowing; that repeated efforts were necessary, in order to make substances, in any degree hard, pass down into the stomach; that these efforts produced a sensation of choking, and were attended with some pain; and that even fluids were not taken in with the same facility as formerly.

From this period, finding the symptoms of his complaint gradually becoming more alarming, and his constitution evidently more impaired, he judged it expedient to solicit medical advice, and was accordingly visited for that purpose, on the morning above mentioned, and under the circumstances already noticed.

He immediately lost blood from the arm, to the amount of sixteen ounces, and a large blister was applied to his chest: the epispastic produced its expected effects, and finding him somewhat relieved, a cathartic, composed of the submur. hydrarg. and pulv. convolv. jalap. in syrup, was administered, and the antiphlogistic treatment pursued for several days. As he could now swallow nourishment with more ease than for some time previous, he determined upon a temporary abandonment of his professional business, and to retire, for a few weeks, into the country. Thither he went, but without benefit; his primary disease, instead of being mitigated, was increased in its severity, and to a degree that he was induced to subsist almost exclusively upon food of a fluid consistence, as beef and veal broth, oatmeal gruel, panada, &c. He, however, could swallow with much greater ease at one time than at another. In this condition he returned to this city about the close of September. Beside the difficulty of swallowing, he now complained of pain under the region of the scrobiculus cordis, and of considerable irritation and soreness of the chest, doubtless the effect of exposure to sudden changes of temperature, during his excursion in the country.

On the 1st of October he was again bled freely; blistering was again had recourse to, and active purgatives prescribed. He considered himself as deriving but little advantage from this mode of practice: whenever he omitted thoroughly to masticate his food, he was liable to returns of the spasms in attempting to get solid nourishment into the stomach; and water, whether hot or cold, could seldom be taken freely with impunity. The patient's constitution having become materially enfeebled by the continuance of his disease, and the active means used for its removal, blood letting, blisters, and other depleting remedies, not answering the indications of antispasmodics, it was determined upon, in consultation, to use mercury, both on account of its general deobstruent effects, and the acknowledged celebrity it had long ago obtained in the removal of affections of the same, or of an analogous character.

On the 7th of October he commenced taking the submur. hydrarg. grains two, twice a day, and shortly after, in order the sooner to excite the action of this mineral on his constitution, the ungt. mercur. fort. was rubbed upon the lymphatics of the chest, of the inner parts of the thighs, and of the legs. Opium was occasionally given to prevent the undue action of the mercurial salt upon the bowels. He was also bled on the thirteenth, on account of a severe spasm, and had an additional blister applied, which, with other blisters, was dressed with the mercurial ointment. He continued under the mercurial treatment nearly seven weeks, during which time no means, calculated to produce a preternatural increase of the salivary discharge, were neglected; but all endeavours for this purpose, were followed with very partial success, a slight soreness of the gums, which lasted for a few days, being all that was apparent.

At the beginning of December, the patient's constitution was still more enfeebled. He expressed little inclination for nourishment, and much less than his ordinary quantity sufficed. He complained of great pain while attempting to swallow, but did not suffer so much from his dyspeptic symptoms. He frequently rejected what he swallowed, but the exertions which he now made for this purpose, were scarcely under the control of the voluntary powers, and were accompanied with comparatively little pain. The stricture of the œsophagus was evidently greater; even jellies in very small quantities could be taken in but slowly, and with great difficulty. The bowels at this period were generally costive: pulse, heretofore about natural, was now quickened; respiration more frequent and anxious; the heat of the body scarcely increased. Sometimes he laboured under slight cough, and represented that he experienced a sense of tightness under the sternum, with occasional pain extending along the anterior extremity of the ribs, in the course of the attachment of the diaphragm. He also obtained but little sleep; his intellectual faculties were not impaired, and he indulged strong hopes of recovery. Pills of equal parts of aloes and gamboge, grains three, were ordered to be taken as occasion might require; blisters were directed to be applied to the parts more immediately the seat of pain, and to be dressed with mercurial ointment, and the use of demulcent drinks recommended.

The symptoms of his disease were, in some degree, increased about the commencement of January, and the affection of the thoracic region more general: he continued to refer the pain not merely as under the sternum, but as extending itself, and being almost constant in the course of the diaphragm, and though not quite so acute as about two weeks previous, yet as giving him much distress, and occasioning a sensation of fulness. He was also considerably troubled with hiccup. He rejected his food upon swallowing, and immediately after retching a mucous excretion succeeded. Sometimes the mucous discharge was in considerable quantity, and variegated in its appearance with purulent matter. His restlessness at night was greater; the energies of his mind were not diminished. Though little benefit was expected from any mode of treatment that could be adopted, he was now directed still to continue in the application of blisters and other irritants; to keep up the peristaltic motion of the intestines by cathartics, and to take opiates at bed time. He was particularly desirous of milk, which aliment was ordered him.

On the 20th of January, he stated to his medical attendants, that the soreness of his chest was greatly lessened. He, however, was not inclined to take food, and when he did, it was most commonly thrown up,

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combined with mucus and a purulent secretion. The functions of the intestinal canal being nearly restored to their natural state, he seldom had recourse to evacuant medicine. He was, at this period, ordered to continue his diet as formerly ; milk and porter, lime water and milk, and at intervals the decoct. quassiæ compos. a wine glass full, at each portion.

February 4th. The patient, agreeably to request, during several days in the latter part of January, took exercise in the open air ; but he at present found his weakness increase to a degree that forbad the same muscular exertion. He continued the greater part of his time in a horizontal posture, with his head a little elevated ; he was much emaciated, and in addition to his ordinary sufferings, complained of a heavy pain in the back and loins : his pulse was quickened, and respiration somewhat frequent. The nutriment, taken during the twenty-four hours, at this stage of his illness, was never more than two fluid ounces ; generally about one, and was seldom retained. No particular alteration was made in the prescriptions ; to mitigate his distress he occasionally took a grain of opium.

Feb. 10th. The disorder was manifestly progressive. The difficulty of swallowing much greater ; he now suffered from soreness of the throat ; the food he took was rejected almost immediately, with an increased quantity of the purulent matter ; the bowels were frequently disturbed ; his voice was weaker than natural, but loud enough to be distinctly heard. A flannel bandage was recommended to give support to the abdominal muscles ; opium to arrest the undue action of the intestinal canal ; and the balsam. copaif. twelve drops, to be taken four times a day, as a stimulant. The volatile liniment was directed to be externally applied about the throat.

Feb. 14th. Though still more emaciated, his strength was not at all diminished, for the last ten days : the soreness of the throat was now, indeed, more extensive, and the quantity of purulent matter greater, and mixed with a peculiar black material, apparently analogous to the animal charcoal obtained by Dr. Pearson from the bronchial glands, and from the lungs:* the diarrhœa continued; pulse and respiration about natural; mind not depressed. He was enjoined to continue in the use of the remedies last stated; but to take an increased quantity of opium, united with tincture of kino.

In the course of the subsequent week, the troublesome affection of the bowels was subdued, though the secretion of purulent matter was greater and darker coloured: He also brought up a great deal of mucus, particularly after speaking. The soreness of the parts about the base of the tongue, and round the throat, was augmented, and he articulated slowly, and with difficulty. He expressed great desire for food; but the quantity of aliment he took within the twenty-four hours, was scarcely one fluid ounce of the consistence of panada.

Feb. 28th. The symptoms of general debility were materially aggravated: the affection of the throat was not as painful, nor did the occasional efforts which he made to swallow, give him uneasiness: but the passage to the stomach was so impeded, that his nutriment was almost instantly rejected, discoloured with the purulent and seemingly carbonaceous matter. Attacks of coughing occasionally seized him, and by these he was assisted in freeing himself of the morbid secretion, which now amounted to eight ounces daily. Under his present circumstances, the hiccup was still the source of much distress to him. He was requested to continue in the use of opiates; and, to support life, enemata of mutton suet, &c. with tincture of thebaic, were administered.

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* Philosophical Transactions of London, part 2. for 1813.—Lond. Med. and Physical Journal, vol. 31. p. 128.

March 3d. The marasmus was extreme, and yet he was willing, and indeed able, to exert considerable muscular motion, inasmuch as he at times walked about his room. He suffered an increased difficulty in respiration, and it was irksome to him to eject the purulent matter. The hiccup continued distressing to an uncommon degree.

On the 6th of March, he articulated more indistinctly, and with increased difficulty; but the soreness of the throat was not so distressing. Beside greater restlessness, he was often disturbed at night with a sense of suffocation. The purulent secretion was diminished in quantity, though not altered in quality : at this period he also laboured under great thirst: his debility was so great, that it was scarcely practicable, and no longer deemed expedient, to have recourse to enemata for his support.

During the two following days, he scarcely retained the power to articulate ; and he did not expectorate so large a quantity of matter: he complained of excessive thirst, and desired cold water, of which, to the astonishment of his friends, he was able, by repeated efforts, to swallow several ounces.

On the morning of the 9th of March, his symptoms were still more unfavourable, and though he was apparently exhausted, yet the faculties of his mind retained a large share of their accustomed vigour, and continued undisturbed: at 12 o'clock the hiccup became incessant, and at 5 o'clock, P. M. he calmly expired, worn out from the irritation of disease and from inability to take nourishment.

Leave being obtained to open the body, I carefully examined it, fourteen hours after death, in the presence of Dr. Hosack and Mr. J. B. Stevenson. The following appearances were observed.

MORBID APPEARANCES ON DISSECTION.

The emaciation of the body was extreme; not a particle of adipose substance was visible, and upon removing the common integuments from the anterior part of the neck and chest, and cutting open the abdominal parietes, the muscles themselves seemed to be completely wasted.

Upon raising the sternum, its lower surface and the anterior mediastinal cavity presented strong marks of disease; the thyroid gland was apparently neither enlarged, nor in any degree materially affected. The larynx and trachea showed the effects of former inflammation, and a small portion of the posterior part of the trachea was destroyed by ulceration, which formed a communication with the œsophagus. The pharynx had undergone considerable changes from disease; its inner membrane was ulcerated in various parts, especially at the inferior extremity, and that side of it which is next the trachea. Upon laying open the œsophagus, the following appearances were exhibited.

The parietes of the œsophagus, throughout their structure were more than ordinarily thick, and in several, and at distant places, hard and scirrhous in their texture. Somewhat more than an inch from the cardiac orifice of the stomach, there was a stricture which extended upward one and an half inches in length: the substance of the part involved in the stricture, was thicker than elsewhere: its several coats were distinctly observed: the rugæ were hard to the feel; the transverse muscular coat was contracted, and the outer one materially altered, as if from inflammation. The strictured part of the œsophagus was so narrowed in its canal as to be impervious to a common sized probe. Just above the stricture, toward the right side and posterior part of the œsophagus, there was a tubercle two thirds of an inch long, and half

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an inch broad, lying obliquely transverse, seeming sacculated and hard. Upon a closer examination this tubercle was found to contain a material of a cheese-like consistence. A short distance above the tubercle commenced the ulceration of the œsophagus, presenting an extraordinary mass of disease. The ulcer involved the several coats of the œsophagus so as to render it impossible to discriminate between them; those parts which were not affected by suppuration were augmented in thickness, and were, in many respects, of a scirrhous or gristly nature. About an inch above the tubercle, the ulcerous erosion had created an opening into the trachea. The upper part of the œsophagus, nearest the vertebræ, was deeply excavated by the ulcer which here formed a sinus of some extent. The inferior extremity of the pharynx also partook of this diseased condition of the œsophagus. The aorta was firmly attached to this tube, but in no wise altered in its structure.

The stomach was considerably contracted: externally, it manifested no marks of disease, and its several coats could be easily traced; internally, it was supplied with its ordinary mucus, and contained about an ounce of fluid: its rugæ were very large and numerous, and increasing in size as they approached the inferior orifice. The duodenum was partially contracted, but in every other respect natural. The other intestines were not particularly examined. The liver was of the ordinary magnitude, and both externally and internally presented a healthy appearance. The gall bladder was full of yellow bile of a thin consistence: its duct, as well as the ducts of the liver, was of the common size, and pervious. The spleen had undergone some slight deviation from its healthy structure: it was rather larger than this viscus commonly is, and its vessels were in a highly turgesced state. The pancreas, though considerably enlarged, did not exhibit to the eye any alteration in its structure; but upon further inspection, it was discovered to be remarkably hard, and partially cartilaginous. Its lobulated structure was nevertheless discernible: its excretory duct had preserved its character. The omentum was rather contracted, possessed little fat, and evidenced some signs of former inflammation.

The heart had not a vestige of fat about it; was uncommonly small, but otherwise natural: the pericardium contained between two and three ounces of a serous fluid. The lungs exhibited a very peculiar and striking appearance, unlike any that I find described in Bonetus,* Morgagni,† Clossy,‡ Haller,§ or Baillie.‖ They were throughout in a state of induration, completely filled the thoracic cavity, and had formed the most extensive adhesions. This was particularly the case with the right lung, which was firmly united to part of the pericardium by a strong membranous adhesion, to the pleura of the ribs, to the mediastinum, and to the diaphragm; the lung itself was changed into a very firm substance, resembling a scirrhous gland; it resisted pressure, and did not collapse when cut, nor pour out any blood. On the surface of the lung, and internally, there were numerous bodies of a scirrhous appearance, of different figures and sizes, from that of a pea to that of a common grape; some were of a much larger diameter: in some few parts they were found to be separate from each other, and in other parts they were coalescing, and formed large morbid masses. They were rather more numerous on the outer than in the inner portion of the lung, and occasioned considerable irregularity of its surface. With the exception of their being of different sizes, they all possessed a similarity of character, adhered closely to the substance of

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* Sepulcretum, sive Anatom. Pract.

† De Sedibus et Causis Morborum.

‡ Observations on the Diseases of the Human Body.

§ Pathological Observations.

‖ Morbid Anatomy of the Human Body.

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the lung, and when cut into caused a crepitus, and imparted a gritty sensation analogous to that arising from dividing matter intimately mixed with large sandy particles. They had no peculiar covering that could be detached, and did not possess any vascularity. The left lung was adhering to the mediastinum and to the diaphragm, and between this lung and the pleura costalis, there was effused about eight ounces of a semipurulent fluid. The inferior part of the left lung was also by no means of so firm a consistence as that of the right. It nevertheless had many of those scirrhous bodies on its surface, and throughout its texture. Upon cutting into it a frothy purulent fluid oozed out, in very small quantity. The colour of these indurated bodies, so numerous in both lungs, was that of an extremely dark blue, or almost black. Of the diaphragm, it has already been stated, that it was strongly and closely attached to the right and left lungs; and from all that was noticed, it was apparent that the inflammation had extended much deeper than the common pleuritic covering of this muscle.

The history of the preceding case, with the detail of morbid appearances upon inspection after death, seems to furnish room for one or two remarks.

As to the causes which laid the foundation of the disease of the œsophagus: these, I think, are abundantly obvious. Irritation is acknowledged to be a frequent cause of spasmodic action. That the disorder now noted was, at its commencement, of a spasmodic character, may be concluded from the manner in which the patient was first attacked, from the mode in which relief was obtained, and from the return of the complaint at intervals. That repeated returns of spasms, whether affecting the œsophagus, intestines, or urethra, may, and frequently do produce a thickened and irritable condition of the part thus acted upon; that the ordinary secretion of the part, the seat of such attacks, may be diminished in quantity or altered in its nature; that the disposition to take on spasmodic action may increase, and the ability of the part to relax be diminished; and that, ultimately, the passage of the canal may become more narrow, and its sides at length be brought into a state of co-aptation, seem to be opinions sufficiently well established. In like manner a spasmodic may become a permanent stricture. Certain habits of body are disposed to spasmodic affections in general, and the same habit more at one time than at another: thus, strictures of the œsophagus occur more frequently in females than in males, and in persons whose susceptibility to impression is increased by debility, or some other cause. Such is the fact with regard to almost all the cases of stricture of the œsophagus recorded by Sir Everard Home,* and with a very large majority of instances of the disorder as related by other writers.

In the present instance there can be no room to doubt, that the derangement of the stomach, first occasioned by the malignant yellow fever, most materially contributed to the formation of the stricture of the œsophagus, by rendering this tube in a particular degree susceptible of irritation and of morbid contraction: and the opinion so cautiously expressed by the celebrated Abernethy, is strengthened by this view of the cause of this disease. Speaking of spasmodic strictures of this part, he observes; "Many cases have occurred to me lately, in which the irritation of the œsophagus seemed to be first excited and afterward maintained by disorder of the digestive organs."†

There are other reasons which may be advanced in corroboration of this opinion, and they are those which seem to be obviously deduced from what is known of the predisposing causes of some of the most

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* See Practical Observations on Strictures in the Urethra and in the Œsophagus.

† Surgical Observations, part 1. p. 184. Ed. 1809.

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decided cases of stricture and scirrhus of the pylorus, though, indeed, the glandular structure of this part, in its most healthy state, must not be overlooked as a concurring circumstance, favourable to the production of affections of this kind, as remarked by Dr. Baillie;[*] in which opinion, however, he had long been anticipated by Hoffman.[†] When the stomach has lost its tone, it is more particularly liable to disorders of this alarming nature. The case of the late distinguished Dr. Peter Middleton, Professor of Medicine in King's College, is a memorable example of this truth. Debility of the digestive organs, as I am informed by the venerable Dr. Samuel Bard, preceded the formation of the stricture and scirrhus of the pylorus, from which he died in January, 1781, after ten months' suffering. The particulars not long since made public, by the late Doctor Ferriar of Manchester, of a case of unmixed scirrhus of the pylorus favours the same deduction;[‡] and in another formidable instance of the same distressing complaint, which was followed by considerable ulceration, as dissection proved, and which occurred in the practice of Dr. Hosack, in March last, frequent attacks of diarrhœa, for a period of four years, prostrated the patient's strength, and were among the precursors of the disease.[§]

On the 4th of June, the present year, I examined the body of a female subject, aged thirty-eight, who had died on the preceding day, of a complication of distressing symptoms. Among other morbid changes which were perceived, was a scirrhus of the pylorus, which completely closed the inferior passage of the stomach, and about which part, externally, was attached a tuberculated excrescence two inches in length, and half an inch in breadth. This patient, as was stated upon the best evidence, had undergone extreme corporeal suffering for more than twenty years, in consequence of a most weak and irritable condition of the digestive organs, and an uncommon state of the hepatic viscus.*

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[*] Morbid Anatomy of the Human Body.

[†] Medicin. System. Rational. tom. 3.

[‡] Med. Hist. and Reflect. vol. 4. p. 111.

[§] See the Details in the present paper constituting the second case of Morbid Anatomy.

But subsequent observation and experience will determine, whether this idea of the predisposing causes of these affections of the œsophagus and of the stomach, be tenable or not.

It has been observed by Sir Everard Home, that where strictures of the œsophagus have been of long continuance, ulceration takes place on the side of the stricture next the stomach. The case before us furnishes an example directly of an opposite nature : from the cardiac orifice to the commencement of the stricture not the least sign of disease could be discovered. We also find that the stricture preserved its character entire, though the œsophagus was ulcerated to an uncommon degree and extent. The causes of the appearance of the stomach meet with a ready solution, when the nature and small quantity of the aliment it received for a long time are considered.

That the morbid state of the pancreas must have added to the disordered condition of the digestive organs, will be readily admitted, upon whatever pathological principle the fact is attempted to be explained. In his Observationes Medicæ, Tulpius has inserted, at considerable length, the particulars of a remarkable case of diseased pancreas. In this instance, one of the most prominent symptoms of disease was the inability of the patient to sleep, or to find relief in any other than in an erect position ; for whenever he took a horizontal

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* See the Details in the present paper constituting the third case of Morbid Anatomy.

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posture, he suffered extreme distress in the loins, abdomen, &c. In noting the most serious consequences arising from affections of the pancreas, among others Tulpius enumerates vomiting and great restlessness.* Indeed, it seems necessary to advert to the indurated state of this gland, in order to account, in some degree, for the great sickness and remarkable irritability of the stomach, and particularly for that obtuse, circumscribed, and constant pain in the epigastric region, of which the patient, the subject of the present case, so long and so loudly complained. These symptoms, and particularly the latter, have been observed almost always, I believe, to be attendants upon an indurated and enlarged pancreas. They are prominent among the features of this disease, as we find in Bonetus,† and Morgagni :‡ Riverius did not omit to specify them,§ nor was Stoll ignorant of them :‖ they are noticed in the case which fell under the care of Dr. Clossy, formerly professor of Anatomy in King's College in this city ;¶ they are described by Baillie,** and are considered among the most certain indications of an enlarged and scirrhous state of this viscus, by Dr. Sewall, of Boston, as ascertained by him in two striking instances upon examination after death.†† In a late communication on tumours, which have occasionally been mistaken for diseases of the liver,

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* Observationes Medicæ, lib. iv. cap. 33.

† Sepulchretum Anatom.

‡ De Sedibus et Causis Morbor. Epist. xxx.

§ Opera Riverii, Praxeos Medicæ, lib. xii.

‖ Ratio Medendi, vol. 1.

¶ Observations on some of the Diseases of the Parts of the Human Body, chiefly taken from the Dissection of Morbid bodies, p. 81.

** Morbid Anatomy, third ed. p. 270.

†† New England Journal of Med. and Surg. vol. 2. p. 21.

Dr. Latham, of London, points out the diagnostic signs of an indurated pancreas, and has noticed as such the pain in the region of the scrobiculus cordis and the dyspeptic symptoms.*

How far the hiccup, which proved so distressing to the patient, depended upon the affection of the diaphragm, I shall not venture to conjecture. This important muscle was, however, most materially affected, and yet that violent train of symptoms that designate diaphragmitis, (paraphrenitis diaphragmatica,) according to nosological writers, was at no time present.†

It is very generally supposed that ulceration of the superior part of the œsophagus, particularly when it has proceeded to any considerable extent, produces an enlarged or hardened condition of the thyroid gland. The case now described, will induce us to limit the application of this pathological doctrine.

The appearance of the pulmonary organs is a circumstance too singular to pass over without notice. The picture attempted to be sketched of the changes wrought in the lungs, conveys but an imperfect idea of the morbid anatomy of this part, and none of the symptoms under which the patient laboured, was pathognomonic of such changes existing in the system; though it must here be stated, that he oftentimes, long before the affection of the œsophagus, complained of sufferings of an asthmatic kind. The repeated and long continued complaints of an inflammatory nature affecting his chest, the indifference with which he regarded them, and the mechanical pursuit which he steadily, and for many years, followed, are probably the most efficient

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* Medical Transact. of the College of Phys. of London, vol. 4.

† Sauvages, Nosolog. Method. De Haen.

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causes that can be assigned for the remarkable alteration visible in the lungs.

The lungs have been observed to be converted into a solid body resembling the liver, and the change has been ascribed by Dr. Baillie, to a "wide extended inflammation," in which a large quantity of coagulable lymph has been extravasated into their substance:[*] and this conversion, according to Mons. Dumas, frequently supervenes after inflammatory affections of the pulmonary organs.[†] Earthy concretions, of a considerable size, have been found in the lungs, according to Morgagni:[‡] Bonetus has given numerous cases of asthma and dyspnœa depending upon stony-like indurations in the same organs;[§] and the same elaborate writer has informed us, that in constitutions where a strong predisposition to the formation of bone has existed, a portion of the lungs has been converted into an osseous substance. Foreign bodies of different kinds have been found in the pulmonary vessels of artists of different professions, as we learn from Ramazani and others,[‖] and the distinguished Dr. John C. Warren, of Boston, has lately published the particulars of a case of organic disease in which the lungs were transformed into a hard tumour, so that the thoracic cavity was completely filled by a resisting solid body.[¶] But I have searched in vain to find an instance of diseased lungs similar to the one endeavoured to be described. The account which the late Dr. Stark has given of the character and situation of tubercles found in these organs, is applicable, in some few respects, to the bodies perceived in the present case, but in other respects, will in no degree answer.* The lungs, indeed, scarcely retained the least trace of their original organization; with their increase of solidity, they possessed an increase of bulk, and it must be matter of surprise how the respiratory process, so imperfectly performed, could support the vital powers to the degree it did. The term scirrhus, used to designate the indurated bodies found in their substance, and on their surface, is had recourse to for want of one more characteristic. They were of a firmer texture than bodies of a scirrhous nature, and from this circumstance, as well as from their atro-purpureus colour, and there being no appearance of suppuration in them, their peculiarity may be ascribed to the minute ferruginous particles floating in the air, which the patient inspired while engaged at his professional business.

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[*] Morbid Anatomy, p. 75.

[†] London Med. and Physical Journal, vol. 16. Principes De Physiologie.

[‡] De Sedibus et Causis Morborum, epist. xv.

[§] Sepulcretum, lib. 11. sect. 1. De Respiratione lesa.

[‖] De Morbis Artificium: vide also Bonetus.

[¶] New England Journal of Med. and Surg. vol. 1. p. 124.

So slight were the appearances of suppuration in the lungs, that it cannot be said, with certainty, whether any of the mucus or purulent matter which the patient ejected during his illness, did or did not proceed from them: the ulceration of the œsophagus and trachea, was probably sufficient to account for all that he expectorated.

With regard to the medical treatment, the reader will anticipate the remark, that medicine could avail but little. After the inefficiency of the mercurial plan was fully shown, the means employed were those which seemed best calculated to prolong life on the most advantageous terms: the application of caustic was not made from a belief that it would greatly augment the sufferings of the patient and fail in producing a radical cure.

To conclude: the present will stand conspicuous among that class of cases observed by clinical practitioners, wherein the mind remains uninfluenced by corporeal disease ; where the greatest physical disorganization of the thoracic viscera may exist while the intellectual powers preserve their integrity, and manifest their wonted vigour and functions.

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* London Medical Communications, vol. 1. p. 361.

II. CASE *of* SCIRRHUS *of the* PYLORUS.

To the preceding paper I am induced to add the following particulars of a case of *scirrhus of the pylorus,* to which reference has already been made. Repeated observation has, indeed, abundantly proved how various and perplexing are the symptoms of organic affections of the stomach. The diagnostic part of medicine must, however, to some extent, be advanced, by prosecuting inquiries which connect the signs of diseased action, with those morbid changes of structure which may be considered either as the cause or the effect of symptoms which manifested themselves before the extinction of the living principle. The present case exhibits, in a striking degree, the characteristic symptoms of this incurable affection of the pylorus. See Dr. Ferriar's Medical Histories and Reflections, vol. 4. and the Review of Mons. Chardel's *Monographie des Degenerations Skirreuses de l'Estomac,* in the Edinburgh Medical and Surgical Journal for 1812.

J**** B*********, in the 49th year of his age, was of a spare habit of body, particularly in the early part of his life ; was brought up to the trade of a wheelwright, in the place of his nativity, New England, but for a considerable time past has been engaged as a practical farmer in New-Jersey. For nearly ten years previous to the illness of which he died, he had enjoyed a very good share of health, with the exception of occasional attacks of diarrhœa, which, during the last four years, became extremely severe and troublesome, weakened his digestive organs, and greatly impaired his constitution.

During the war just closed, as a subordinate officer, he was actively engaged in the discharge of duties incident to his military appointment, and frequently subjected himself to the vicissitudes of the weather: during an inclement season in September, 1814, while on the sea coast at the Narrows, he contracted an inflammatory disorder of his chest, from which, however, he was soon relieved. About this period he found his appetite for food decreased, and, from the diminished quantity of nutriment upon which he lived, his health was much impaired. He stated that he felt considerable soreness under the region of the pit of the stomach, and further added, that, although he had not before made it known, he had suffered this particular pain repeatedly before, and at considerable intervals. He was not, at this time, under the care of any medical attendant, aad all he did for his complaint, was living upon aliment less exciting and more easy of digestion than that to which he had been accustomed.

During October he was sometimes affected with nausea, and ejected the contents of his stomach; but in the subsequent month, it was a common occurrence with him to be attacked with excessive vomiting, particularly upon lying down upon his right side. Toward the close of November he applied for the advice of a neighbouring physician, who recommended the application of blisters, and the use of cathartics, for the purpose of diminishing the soreness under the scrobiculus cordis, and of allaying the irritability of the stomach. Though he enjoyed a respite from pain, at intervals of some twenty or thirty hours in length, it was evident that his disorder was becoming more formidable.

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In December he was often under the necessity of ejecting the contents of his stomach two or three times a day, and so enfeebled were the powers of digestion, that a cup of common gruel would induce him to make efforts to vomit. The quantity of the material discharged by the stomach was nearly equal to the amount of food taken, which rendered it conclusive, that only a very small portion of his aliment entered into the intestines. At this period his mind participated in the diseased condition of his corporeal system, and for the remainder of his sickness he laboured under extreme lowness of spirits, fully convinced, as he said, that he should never recover his former health.

His attacks of vomiting became more frequent during the months of January and February. He continued to complain of great and more uniform pain in the region of the scrobiculus cordis, where something like a circumscribed tumour was felt. He most generally ejected about half an hour after swallowing; the food thus discharged had undergone but very little alteration by the digestive process, and was mixed with some viscid matter. If he attempted to seek repose by lying on his *right* side, extreme nausea and vomiting were inevitable. Although his exertions to eject required no labour, yet the materials thus thrown up, were discharged with violence, in a projectile manner, and at the distance of many feet. After vomiting he experienced some few moments' exemption from distress. His bowels were obstinately costive; the urinary secretion small in quantity, and high coloured; his constitution much enfeebled, and his emaciation very considerable. Some attempts, as I ascertained, were made at this stage of his disorder, to subject his system to the action of mercury, but these attempts proved unsuccessful. Sedative medicines availed but little, and active cathartics were required to excite the intestinal canal to its wonted functions. He now had great desire for nutriment, but the anxiety he felt on account of the vomiting that was sure to take place upon eating, induced him to make a cup of milk his principal support for the twenty-four hours.

As circumstances permitted he was occasionally visited by Dr. Hosack in the month of March, at his residence in New-Jersey: at this stage of the disease there was a regular increase in the disorder of his stomach, and his bodily and mental powers became more and more impaired. His stomach contracted upon the least quantity of aliment, whether in a solid or fluid state; he was also much annoyed with cardialgia and eructations of an acid and fœtid nature: his food was seldom retained longer than five minutes, and discharged with additional violence: the quantity of the substance thrown up was greater than that of the nutriment taken in; its appearance was changed to a dark sootlike material of a fluid consistence, united with some purulent matter, and emitted an extremely offensive odour. The evacuations from the bowels, which were however very seldom procured, and then but with much difficulty, appeared to have undergone the same changes as the matter discharged from the stomach, and were said by the patient to exhibit, to a considerable degree, both in colour and consistency, the appearance of tar. Toward the close of his illness, his stomach became more retentive, and he frequently complained of excessive thirst. At the suggestion of Dr. Hosack the patient now took very small draughts of lime water and milk, which were sometimes succeeded by a few moments' relief. His bowels remained in a constipated state for more than six weeks previous to his decease, and his only means of support were, for an equal length of time, nutritious enemata. On the morning of the 15th of April he breathed his last.

The abdominal viscera were examined six hours after death by my friend, Dr. Caspar W. Eddy. Several small whitish tubercles were seen on the surface and in the parenchymatous substance of the liver. There were no morbid appearances in the spleen, pancreas, or in the

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intestines. The superior portion of the mesentery exhibited some slight marks of disease, being more than ordinarily thick, and preternaturally hard, and possessing here and there small tubercular elevations. The stomach was more than three times its common size, and was distended with a black fluid, resembling a mixture of soot and water combined with a small quantity of glutinous matter, and was particularly offensive to the smell. The coats of the stomach investing its superior curvature were greatly augmented in thickness: the cardiac portion was free from disease. A portion of the greater extremity, for about two inches round the pylorus, was in a perfectly scirrhous condition, and full one inch in thickness; a part of this thickened mass had advanced to a state of ulceration. The pyloric orifice made resistance to the passage of a common sized probe.

III. CASE *of* SCIRRHUS *of the* PYLORUS *accompanied with a* TUBERCULATED LIVER.

ON the morning of Sunday, the 4th of June, 1815, I was requested, in connexion with Dr. William Handy, a respectable physician of this city, to examine the body of a female, aged thirty-eight years, who had died on the preceding day of a complication of distressing symptoms. On this occasion our attention was necessarily confined principally to the appearances which might be discovered in the abdominal cavity.

Not the least portion of the omentum was present. The stomach was much smaller than natural, and contained about ten ounces of a dark fluid, intimately mixed with a substance similar to coffee grounds, of a somewhat offensive smell, and seemingly acrid nature; its internal coat presented some slight marks of former inflammatory excitement,

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and its whole surface was covered with a tenacious, dark coloured mucus. The most important change, however, which was found to have taken place in this viscus, was a scirrhus of the pylorus, which, from all that could be perceived, completely closed the inferior passage of the stomach, about which part, externally, was attached a tuberculated excrescence two inches in length, and half an inch in breadth, and greatly resembling, in its colour, that of a natural pancreas.

The whole of the small and great intestines manifested a perfectly sound appearance. Some few of the glands on the mesentery were larger and harder than ordinary. The spleen and the pancreatic gland were in a healthy state. It is an undertaking not altogether void of difficulty, to communicate, by words, an exact idea of the great and remarkable changes which the liver had suffered.

This organ was so much enlarged, that it occupied not only all the right hypochondrium, but also the epigastric region as low down as the umbilicus, and a very considerable part of the left hypochondriac region : previously to our opening the abdominal parietes, its hardened and irregular surface could be distinctly felt under the integuments, covering the parts just noted. Both the convex and concave surface of the liver were vested with *tubera :* there were, probably, about sixty of these bodies on its superior surface ; on the inferior surface they were more numerous. They also pervaded the inner surface of the liver, sometimes in a distinct, and at other times in a confluent form. The tubera were all of the same nature, though they varied in size : on the outer surface of the gland they preserved their distinctive form, elevated the peritoneal covering of the liver, and were sparsely variegated with red vessels : in their colour they much resembled a cream white ; at or near their centre they had a little depression, which presented an appearance whiter than elsewhere. In several places,

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internally, these tubera closely approximated, and seemed to be adhering to each other: the largest of the inner tubera that we noticed, was three and a half inches in diameter, and upon their being dissevered by the knife, a very small quantity of an opake white fluid exuded from them. Upon making various sections, the substance of the liver between these tubera was always found to be less vascular, and its cohesive powers more feeble than natural.

It deserves to be stated, that, notwithstanding the enlarged and diseased condition of the hepatic organ, the gall bladder was half full of well-formed bile; that there was no effusion of water in the cavity of the abdomen, and that at no time, during a long illness, did the patient labour under jaundice.

" I believe," says Dr. Baillie, " that the large white tubercle is not so often attended with jaundice and ascites as the other."

I shall briefly relate the principal circumstances that seem to throw light on the nature of the preceding case, so far as it has been practicable to obtain an accurate knowledge of them.

The patient, from her infancy, uniformly possessed great feebleness of constitution, and for the last twenty years of her life was seldom exempt from disease. She was the mother of several living children. The complaint from which she suffered most severely, was an extreme debility of the digestive organs, which caused her to be at all times cautious in the choice of food; and to depend for alimentary support chiefly upon plain broths and milk. She was never in any degree addicted to the use of spirituous or malted liquors.

The symptoms which distinguished the irritable state of her stomach, were similar to those already mentioned in case the second, though it was only for the last two years that she suffered most remarkably on that account. She often complained of nausea, and frequently ejected her food soon after a meal. Her distress when lying down at night was always aggravated, provided any nourishment had been taken a short time previous; and the pain that gave greatest uneasiness was seated in the *right* side, directly at the inferior orifice of the stomach, and was always aggravated when she laid down upon that side.* The attacks of vomiting sometimes came on very suddenly; and, for several weeks before death, she discharged the contents of the stomach with extreme violence. The functions of the intestinal canal were performed with great regularity until within some few months previous to the termination of her disease.

In the spring of 1813, she suffered from an acute inflammation of the liver; but this affection seems to have been confounded with the disorder of her stomach, as nothing was particularly done for her relief. During the autumn of the same year, she again laboured under another violent attack of hepatitis. From this period she was at no time relieved from distress in the right hypochondriac region, and other symptoms which pointed out a chronic enlargement of the liver. With the exception of an ineffectual attempt to excite the salivary glands by a few grains of mercury, which attempt was made by one of the several practitioners of medicine under whose care she placed herself at different times, the treatment both of the hepatic and of the gastric disorder was exclusively dietetical.

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* Such was the fact with regard to the patient, the subject of case the second. This symptom, indeed, seems to be eminently deserving of recollection, though it does not occupy a place in any of the medical histories of cases of this disease heretofore recorded. I am inclined to think it will be found to be one of the most prominent circumstances indicating the forming stage of scirrhus of the pylorus, and in this belief I am strengthened by the opinion of one of the most accurate observers and experienced practitioners of the present day, Dr. SAMUEL BARD, now President of the College of Physicians and Surgeons in the University of the State of New-York.

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The preceding facts warrant the deduction, that the temperament of the patient, and the extreme feebleness of her digestive powers, were the primary causes of the organic disease of the stomach: that repeated attacks of inflammation, and an inert mode of treatment, laid the foundation for the uncommon appearances of the liver. Habitual excess in the use of ardent liquors, and acute inflammation, are generally considered the principal causes of those changes which lead to the formation of tubercles of the liver: but the tubercles thus produced vary materially in their character: those that are the offspring of long indulgence in spirituous drinks, are, perhaps, in a very great number of instances, of comparatively small size, and the natural bulk of the liver itself is, in these cases, diminished: on the other hand, those tubercles that seem to have been the result of inflammatory action, are of remarkably large size, and often occasion an astonishing increase in the growth of the liver. These facts are strikingly exhibited in the annexed plates.

I have denominated the large white masses found in the liver depicted in plate second, figures one and two, *tubera*, conformably to an arrangement lately proposed by Dr. Farre, of London, who has furnished so clear and interesting a description of these morbid bodies in his elegant work, the Morbid Anatomy of the Liver.* How far the tubera I have endeavoured to describe, bear a resemblance to the character of the *tubera circumscripta* of Dr. Farre, is left to the decision of the reader.

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* Fasciculus I.

IV. CASE *of* TUBERCLES *of the* LIVER.

PLATE second, figure the third, exhibits that peculiar state of the liver which is the frequent consequence of a too liberal and long continued use of ardent and vinous spirits. The tubercles, in this case, are of small size; some not larger than the twelfth of an inch in diameter, others about the size of a common garden pea, or rather larger, and occupy the liver throughout its substance. These bodies, when cut into, according to Dr. Baillie, are found to consist of a brownish or yellowish white solid matter: in the instance before us, they were of the latter sort.

The subject of this disease was the late GEORGE FREDERICK COOKE: the causes which led to the formation of this condition of the hepatic viscus, are equally well known as the professional eminence of this celebrated tragedian. In order, however, to render the present case more satisfactory, it may not be improper to insert some few particulars relative to the last illness of Mr. Cooke, and the account of morbid appearances as observed upon inspection after death. These I have extracted from the letter of Dr. Hosack, addressed to William Dunlap, Esq. the biographer of Cooke, and published in his Life, volume the second, to which work reference may be made for more ample details.*

Sept. 1812. "At that time," says Dr. H. "his abdomen had become very much enlarged, attended with great hardness in the region of the liver, and a sensible fluctuation occasioned by water in the cavity of the belly. His bowels, at the same time, were in a constant state of constipation, except when excited by the most drastic purgatives. His lower extremities were also anasarcous, and a general yellowness was diffused over the surface of the body, all evidently pointing out the deranged condition of the liver, as well as the debilitated state of his whole system."

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* See also American Medical and Philosophical Register, vol. 4.

"On the 17th of September I was again called upon to see Mr. Cooke, in consultation with Dr. McLean. Mr. C.'s strength was now so far expended, that we found it impossible to prescribe any thing that was likely to prove useful for the removal of his disease: we, therefore, from this period, directed our attention chiefly to the relief of particular symptoms, as they occasionally appeared during the progress of his complaint. On the evening of the 25th, he was seized with sickness at the stomach, which was soon succeeded by violent vomiting, and the discharge of a large quantity of black grumous blood; by this evacuation his strength was suddenly exhausted; but the vomiting was at length allayed by a mixture of laudanum and mintwater. Mr. Cooke, however, survived until six in the morning, when, in the full possession of his mental faculties, and the perfect consciousness of his approaching change, he calmly expired."

ACCOUNT OF MORBID APPEARANCES.

"A few hours after his death, having obtained permission, I examined the body for the purpose of ascertaining the state of the abdominal viscera, and especially that of the liver. Upon opening the belly, we found it to contain about six quarts of water; but the liver, to our great surprise, did not exceed the usual dimensions of that viscus; it was, however, astonishingly hard, and of a much lighter colour than is natural to that organ; its texture, too, was uncommonly dense, making considerable resistance to the knife; in its internal structure, it was so hard and unyielding, that very few traces of its vessels could be found, and the circulation through it had evidently long since ceased to be regularly performed: it exhibited precisely that peculiar *tuberculous* appearance, which was first pointed out by Dr. Baillie, of London, in his Morbid Anatomy.* It also deserves to be remarked, that in the case of Mr. Cooke, as in those described by the distinguished anatomist referred to, the tubercles were not confined to the surface, but extended throughout the greater part of the substance of the liver, as I ascertained by making several sections of it in different directions. The other viscera of the abdomen exhibited no departure from their natural condition, either in their structure or appearance."

EXPLANATION OF THE PLATES.

PLATE I.

Figure 1.—Represents the most striking appearances connected with the morbid condition of the Œsophagus. (*Case 1st.*)

A A A.—The ulcerated portion of the Œsophagus.

B B.—The ulceration of the Œsophagus producing a deep sinus.

C.—The ulcerous erosion in that portion of the Œsophagus where an opening existed between it and the trachea.

D D.—The strictured part of the Œsophagus with its thickened edges.

E.—The strictured part of the Œsophagus laid open.

F.—The tubercle situated directly above the stricture.

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* See Baillie's Engravings, p. 101—2.

G.—That part of the Œsophagus which is below the stricture, laid open, and of a natural appearance.

H H.—The stomach.

I.—The aorta attached to the Œsophagus.

Figure 2.—Illustrates the scirrhus of the pylorus, a part of which is advanced to suppuration. (*Case 2d.*)

A.—The duodenum below the strictured part.

B B.—The thickened portion of the pylorus.

C.—The ulcerated part of the scirrhus.

D.—A portion of the stomach in its natural state.

PLATE II.

Figures 1 *and* 2.—Represent the liver tuberculated. The liver in this case much enlarged. (*Case 3d.*)

Fig. 1.—Is a section of the liver exhibiting its superior or convex surface vested with tubera.

A.—The cut edge of the liver.

B B B.—The superior surface of the liver studded with tubera.

Fig. 2.—Is a perpendicular view of the same section of the liver.

A A A.—The tubera of largest size.

B B B.—The substance of the liver between the tubera.

C.—A blood vessel.

Figure 2.—Exhibits that condition of the liver which frequently arises from long indulgence in the use of ardent liquors. The liver in this disease is preternaturally diminished. (*Case 4th.*)

A.—The convex surface of the liver.

B.—The cut portion of the liver.

For the drawings whence the engravings illustrative of these cases of morbid anatomy have been made, I am indebted to the kindness of James Inderwick and David H. Fraser, of the Medical Department of the United States' Navy, and John W. Jarvis, Professor of Painting, New-York.

JOHN W. FRANCIS.

New-York, June 6th, 1815.

Pl. 1.

Fig. 1.

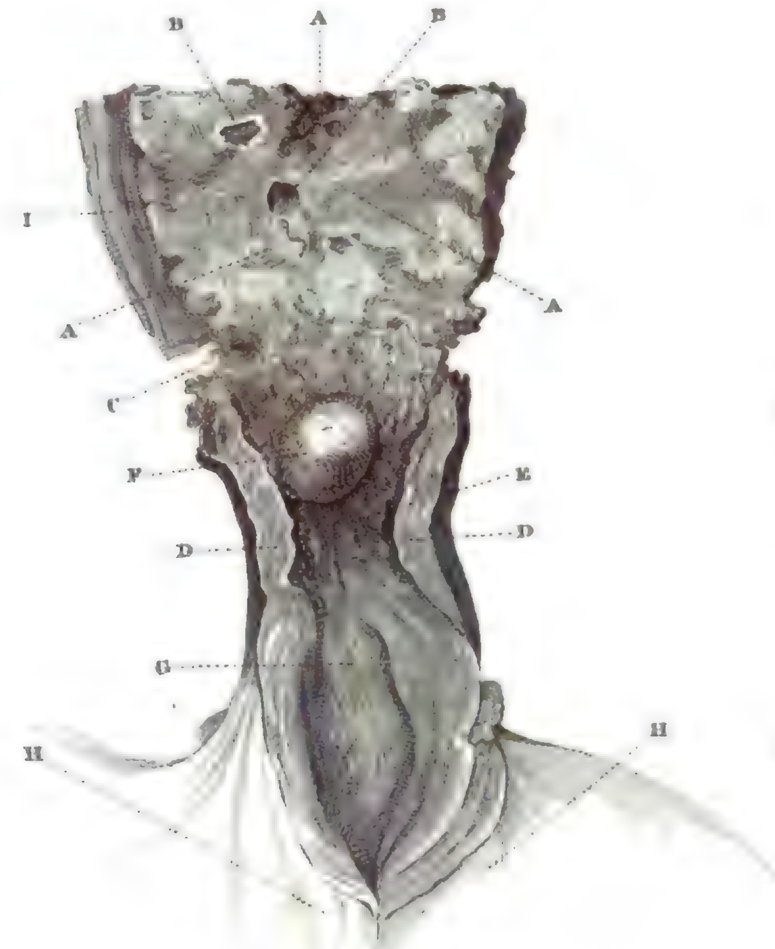
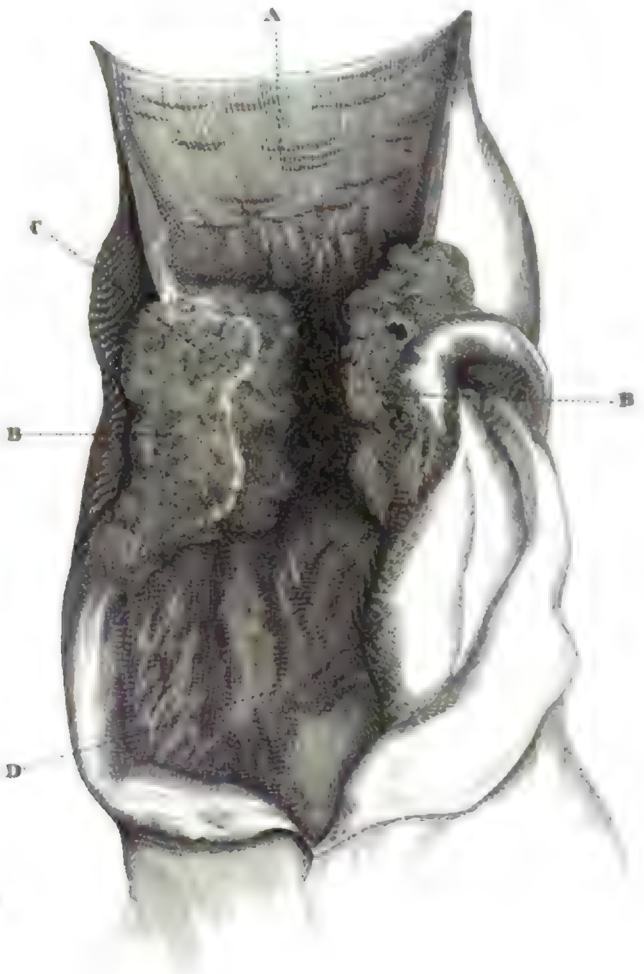


Fig. 2



D. H. Fraser del.

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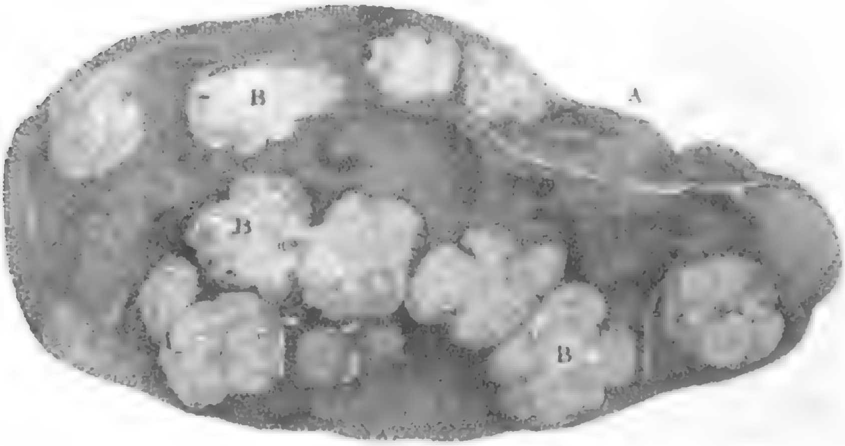

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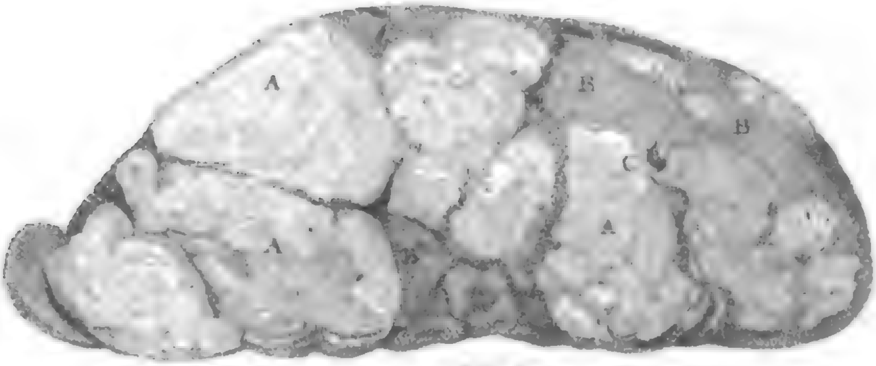

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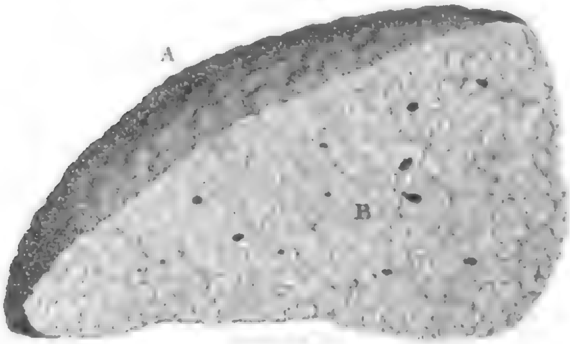

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IX.

CHEMICAL EXAMINATION *of the* MINERAL WATER *of* SCHOOLEY'S MOUNTAIN. *By* WILLIAM JAMES M'NEVEN, M. D. *Professor of Chemistry in the University of New-York, &c.*

[Read before the Society, on the 13th of July, 1815.]

THE mineral water of Schooley's Mountain, in New-Jersey, has of late years acquired so much just celebrity in cases of calculous concretions, that it is equally an object of interest for the physician and chemist to ascertain the nature of a natural production which affords such certain relief in so distressing a complaint.

The bare taste and appearance of this water show that it is a chalybeate. It is strongly characterized by the peculiar astringency and savour of ferruginous impregnations. The reservoirs which receive it have need of being frequently cleansed of a yellow ochrish deposite left there, in considerable quantity, by the running of the spring. The water, though remarkably clear when first taken, becomes turbid upon standing for some time in the open air, and after a longer interval, an irridescent pellicle forms on its surface, similar to what happens, in like circumstances, to other chalybeates. Ochre and other indications of iron, are dispersed extensively through the surrounding rocks and soil. Iron ore is so plentiful in the vicinity, that furnaces are in operation, both in the eastern and western districts of the chain, of which this mountain forms part, and much of the ore is magnetical. Lime-stone is found at the base of the hills and along the valleys. The inhabitants burn it for economic purposes.

Our learned associate, professor Mitchill, has given some interesting geological observations on this district, which he visited in 1810.* He represents Schooley's Mountain as the middle region of the transition chain, which extends in a north-easterly and south-westerly direction across the state of New-Jersey, from the Highlands of New-York to the Delaware. These heights completely divide the waters of New-Jersey. From their north-western slope all their streams descend to the Hudson and the Delaware. From their south-eastern declivity, their currents reach the ocean by Newark and Raritan bays. These elevations have, however, no pretensions to be classed with the Shawangunk Mountains, which are a distinct chain, and make part of the great Alleghany. Schooley's Mountain is of more moderate elevation. Geometrical measurement has determined that its height, above its immediate base, is more than six hundred feet; and Doctor Mitchill calculates, by approximation on the falls of water at the different mill-dams along the hurrying channel of the Musconetcunck to its junction with the Delaware, and on the descent thence to Trenton, that the base itself is five hundred feet more above tide-water.†

Rocks are thickly distributed over the face, and along the sides of the mountain. They consist chiefly of feldspar and quartz. Many masses may be examined without observing a vestige of mica, but a little shistus or hornblende is found embodied in its stead.

The mineral spring is found in the town of Washington, in the county of Morris. It is situated in a deep defile, between two beautifully wooded mountains, and issues from the perpendicular side of a steep rock, about forty or fifty feet above the level of a brook that gurgles and foams over a rocky bottom, within a few paces of it. The extremity of a wooden leader is adapted to the cleft in the rock to receive the water, and convey it to the platform where the drinkers assemble; and to recesses, whither the bathers retire. The spring discharges a gallon in about two minutes and a half, and the quantity is not observed to vary under any changes of season or weather. Its temperature, at its issue from the rock, was found to be fifty-two degrees of Fahrenheit. I instituted the following preliminary trials in order to obtain some general notion of the substances to be expected from the analysis of this water.

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* Vide the valuable Mineralogical Journal of Dr. Bruce, vol. 1. p. 70.

† Mitchill, ibid.

a. Though it seemed superfluous to examine it for iron, yet in order to observe its habitudes with the tests of that metal, prussiate of lime was added to a portion of it fresh from the spring, and tincture of galls to another. The tincture speedily turned it of a fine purple colour, and the prussiate produced a precipitate after a short interval.

b. I boiled a portion of the water, in a glass vessel, down to one half; its transparency was changed, and it assumed a yellowish green colour, such as it acquires by standing a few hours in the open air. After this boiled water had entirely cooled, it no longer gave any indication of iron to the same tests.

c. There was no effect produced by the water from the spring on infusion of litmus, nor on litmus paper.

d. It produced no change in tincture of turmeric, nor in turmeric paper.

e. The addition of concentrated sulphuric acid caused an extrication of air bubbles.

f. Acetite of lead was in nowise discoloured.

g. Oxalate of ammonia gave some precipitate, and, to avoid ambiguity a portion of ammonia was first added, in order to saturate any acid that might be present, since oxalate of lime is readily soluble in the mineral acids.

h. Muriate of barytes afforded no precipitate in the course of three or four hours. Yet this indication is not decisive.

i. Lime water added in equal parts produced a copious precipitation soluble in nitric acid with effervescence.

k. Nitrate of silver changed the colour of the water to a light opal. The same re-agent indicated that the water of the adjoining brook was remarkably free from muriatic salts.

The ninth experiment, especially in the quantity in which the hydrate of lime was employed, shows that the mineral water of Schooley's Mountain contains carbonic acid. When this test is mixed only in small proportion with water holding carbonic acid, the result is apt to be fallacious, as the excess of acid re-dissolves the lime. The super-carbonate of lime will remain in solution when a sub-carbonate would fall to the bottom. By the experiments (*i.*) and (*k.*) it is seen that carbonic acid is the solvent of the iron. The connexion between this result and the constitution of the mountain, is also striking. The mountain abounds in magnetic iron ore, and it is in this state that a carbonated water can take up most of the metal. The water is perfectly clear when fresh from the spring, but soon grows turbid by exposure to the air, and gradually deposites a fine ochre. A part also swims on the surface in the form of a thin shining pellicle. After it falls to the bottom the presence of iron is no longer indicated by the most delicate tests. These effects are proofs of its being a carbonated chalybeate, for the turbidness by the precipitation of ochre and the pellicle, do not take place until the carbonic acid has flown off, whether separated spontaneously, or expelled by heat.

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A water holding sulphate of iron deposites an ochre by absorption of oxygen; but if it contain a carbonate of iron, the precipitate is owing to the separation of carbonic acid. The carbonated chalybeates are by far the most numerous; indeed, any others are extremely rare.

It would appear by (*c.*) that the water from the spring does not contain a free acid; but the just inference, with regard to the absence of carbonic acid, is, that the water does not contain the one eighteenth of its bulk of carbonic acid gas, that amount being necessary to produce the effect of reddening litmus paper.

It appears by (*d.*) that there was not present a free nor carbonated alkali, nor a pure earth.

(*e.*) Showed the separation of some gaseous substance; other trials determined it to be carbonic gas.

(*f.*) Proves the absence of every thing sulphurous.

The result of (*g.*) clearly indicated the presence of lime.

(*h.*) Seemed to exclude the presence of sulphuric acid, but sulphate of lime, when present in only a very small proportion, is not detected, with certainty, by any single test; and, through the subsequent analysis by evaporation, that substance was found to be contained in this water.

(*i.*) Left no doubt of the presence of muriatic acid.

Were it enough merely to determine the quality of this water, and the nature of its ingredients, those trials might be deemed almost sufficient; but no chemical investigation will now be received as satisfactory, which does not exhibit the exact quantity and proportion of all the constituents of a compound. To do this, further experiments were necessary; and if in the detail of these I shall appear to bestow on small matters a disproportionate attention, it will be recollected that exactness is indispensable. Should any error occur in my process, by being minute, I furnish the greater facility of detecting it to those who may be desirous of re-examining the same subject; and the mode I adopt must be preferable, with the generality of persons, to a bare statement of results, without any view of the successive steps by which they were obtained.

ANALYTICAL EXAMINATION.

THE gentleman, whose case follows, while residing at Schooley's Mountain, evaporated, at my request, a portion of the water according to directions I left with him for that purpose, and transmitted to me, as the residue, a brown, light powder, which weighed 16.50 grains. I subsequently procured a few bottles of the fresh water, carefully filled and corked at the spring, and tied over with wet bladder, from which I determined the proportions of its gaseous and solid contents.

Examination of the gaseous constituent part.

The water, as it issues from the rock, is nowise sparkling, it has no pungency, and manifestly holds whatever gas it contains, in a state of combination. Being forced for the purpose of examining it to use a water cistern, I heated this to one hundred and thirty degrees of Farenheit's thermometer, and separating, as atmospheric air, an amount equal to the capacity of that portion of the retort unoccupied by the fluid, I obtained from fifty-seven cubic inches of the mineral water, nineteen cubic inches, nearly, of a gas, the whole of which was absorbed by lime water; so that the mineral water yielded a little more than one third of its bulk of carbonic acid gas.

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Examination of the fixed Constituent parts.

Seventy-four ounce measures slowly evaporated in a water bath, left a brownish extract of 4.10 grs. This gives 7.09 grs. only to the gallon. The proportion of foreign ingredients to the simple element, is, therefore, remarkably small in this mineral water. With the 16.50 grs. sent me I made the following experiments.

1. I poured over the whole between two and three fluid ounces of alcohol of the sp. gr. .847 in a close phial, and shook it repeatedly during twenty-four hours. The solvent acquired a pretty deep brown tinge and took up 4.10.

2. The remaining 12.40 grs. were treated with three fluid ounces of cold distilled water, and shaken frequently during twelve hours. The water was coloured brown, and left an extract on the filter, that, after being thoroughly dried by the heat of boiling water, weighed 4.50 grains.

3. The residue of 7.90 was boiled in 5,000 grs. of distilled water, by which it was diminished 0.65 of a gr. which must have been sulphate of lime. This third solution was still of a pale brown colour, even after the separation of the selenite. All the solutions were kept separate, and the extracts dried, except in one instance, by the heat of boiling water.

Examination of the Solution by Alcohol.

4. A little of the alcoholic solution was tried in a tube the eighth of an inch in diameter, with tincture of galls, as from its brown colour it might possibly contain highly oxidized sulphate of iron; but no trace was discovered of such an impregnation. The rest was slowly evapo-

rated in a water bath: Its colour turned to a deep brown, and it dried but imperfectly, although the bath was made to boil toward the last. In consequence I washed it out with alcohol, transferred it into a platinum crucible, and evaporated it over the lamp. When perfectly dry its colour was black, and it was found to have lost 0.82 gr. of its weight. The brown colour of the residuum, and which tinged more or less every solution, as well as the facility with which it was charred and partly consumed, showed that it contained a considerable portion of vegetable extract. It could scarcely be otherwise with a water that strains through the decayed leaves and ligneous remains of a primeval forest.

5. This residue, on being treated with a little alcohol, left 0.40 gr. of muriate of soda, to which we should add 0.03 of a grain, water of crystallization, for the state in which the muriate of soda exists in the spring.

6. To the remaining 2.85, of the alcoholic extract, there were added a few drops of concentrated sulphuric acid, which immediately occasioned a brisk effervescence, and by putting the crucible with its contents over the lamp, white vapours of muriatic acid were copiously disengaged. The crucible was lastly brought to a red heat to drive off any portion of uncombined sulphuric acid.

The crucible was then washed out with distilled water, and the sulphates were thrown upon a filter. There passed a solution of a bitterish taste, and a portion was retained, upon which distilled water was continually dropped until it came off tasteless. The part retained was next boiled with carbonate of potassa, and filtered; sulphate of potassa passed the filter, and carbonate of lime remained upon it, the whole of which readily dissolved in muriatic acid, and weighed, when dry, 2.35 grains. The bitterish solution was in like manner decomposed by carbonate of potassa, and redissolved in muriatic acid. It yielded of muriate of

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magnesia half a grain. In this manner these two salts were separated from each other, and the amount of each determined as it exists in the mineral water.

Examination of the Solution by cold distilled Water.

7. This was evaporated slowly in a temperature not exceeding eighty degrees of Farenheit. No pellicle or crystal formed on its surface; its taste was insipid to the last. The extract was nearly all soluble in dilute muriatic acid. What the acid left, after being washed, was taken up by alcohol, and amounted to 0.10 gr. of extractive.

To the muriatic solution, ammonia was added until it tasted alkaline; no change appearing, the mixture was heated, but it still remained clear, and gave no sign of magnesia. On trying it, however, with oxalate of ammonia, there ensued an immediate precipitate. Consequently the substance dissolved by the muriatic acid was carbonate of lime, and its amount was equal to 4.40 grs.

Examination of the Solution by Acetic Acid.

8. The residuum, insoluble in alcohol and water, was digested in distilled vinegar for twelve hours, and occasionally shaken. A little being tested in the small tube with oxalate of ammonia, it was found to hold lime, and another small portion being tried with caustic ammonia, the presence of magnesia was also proved. But these earths must have previously existed in the state of carbonates.

The acetous solution evaporated to dryness, gave a whiter extract than any yet obtained. By remaining exposed to the air all night, it attracted a little moisture, corroborative of its containing acetite of magnesia. The evaporated solution weighed 6.35 grains. It dissolved in cold distilled water, with the exception of a minute brown sediment which dried in the water bath, weighed 0.05 of a grain. It seemed to be muriate of lime, for it was not affected by muriatic acid, but touched with concentrated sulphuric acid, it effervesced, and there remained a white smooth residue which was manifestly sulphate of lime formed in the experiment.

To the aqueous solution of the acetate, there was added ammonia in excess, which occasioned a precipitate of magnesia: washed and dried it weighed 0.10 gr. Now, as in 100 parts of acetate of magnesia there are 34.04 of base,* we have this proportion; as 34.04 : 100 :: .10 : .29, which substracted from 6.35 gives .29 acetate of magnesia, and 6.06 acetate of lime. Again, to find the base appertaining to this acetate 6.06; say as 100 is to 34.25, the proportion of base in 100 parts acetate of lime, so is the sum 6.06 to its base 2.08.† But it is necessary to reconvert these acetates into carbonates, in which state they existed in the mineral water, and as in carbonate of magnesia the base is twenty-five per cent. we have .25 : 100 :: .10 : .40.‡ And as the base in carbonate of lime may be stated at fifty-eight per cent. we have 58 : 100 :: 2.08 : 3.586; or say 3.59. Thus we find the two carbonates, that of magnesia = .40, and that of lime 3.59, both = 3.99 grains.

Examination of the Solution by Muriatic Acid.

9. Dilute muriatic acid, digested on the residuum left in the last experiment, dissolved a portion, and a dark muddy sediment remained of a gritty feel. When collected and ignited on the filter it afforded 0.80 of silex.

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* Thompson, vol. 3, p 63. 4th ed. † Thompson, ibid, p. 64. ‡ Thompson, vol. 2. p. 650.

To the filtered solution ammonia was added until it tasted alkaline. A brown precipitate ensued, which, collected and ignited, left 1.40 oxide of iron attracted by the magnet; or say 2 grains carbonated oxide of iron such as it exists in the water. The solution itself was then evaporated to dryness, and as no deliquescence appeared in the course of twelve hours, it was concluded that no alumine is contained in these waters.

SUMMARY.

Extractive	by exp. 4)	0.82	=	0.92
	7)	0.10		
Muriate of Soda				0.43
Muriate of Lime	4)	2.35	=	2.40
	8)	0.05		
Muriate of Magnesia				0.50
Carbonate of Lime	7)	4.40	=	7.99
	8)	3.59		
Sulphate of Lime				0.65
Carbonate of Magnesia				0.40
Silex				0.80
Carbonated Oxide of Iron				2.00
Loss				0.41
				16.50

Remarks on the Medical operation of the preceding Water.

The benefit which the mineral water of Schooley's Mountain afforded repeatedly to Mr. H*****, of this city, has contributed, most of any instance within my knowledge, to establish its efficacy, and raise its reputation. The resources it affords to medicine cannot, therefore, be better illustrated, nor these observations more properly concluded, than by a relation of his case.

Mr. H. laid the foundation of the early eminence to which he has arrived in the profession of the law, to a course of such severe and unremitting study, while a student of Columbia College, as none in that seminary were tempted to exceed; and such, indeed, as no literary or professional distinctions, fascinating as are these objects, can requite any body for acquiring at the same cost of excrutiating disease. From the age of sixteen he led a remarkably studious and sedentary life, scarcely ever sparing himself time to exercise; and this train of close application to books, and these long sittings at the desk, may altogether have filled a period of ten or a dozen years, before the disorder they brought upon him was entirely formed.

Early in the year 1809 he began to feel, when lying down, a sensation of heat in the region of the kidneys. It continued so for some months, was by no means painful, gave no alarm, and barely excited attention. But, in the course of the summer of that year, it increased so far as occasionally to make him restless in bed, without being so troublesome as to cause him to mention it to his physician. At last, one night, toward the beginning of autumn, he was attacked, a few hours before day, by a most excruciating pain in the small of the back. Finding himself almost unable to endure it, he sent for his physician, the late Doctor P. who, among other things, directed fomentations to be applied to the part. After suffering, as the patient then thought, most severely for several hours, the pain suddenly subsided; the relief was as unexpected as the attack, but it left him extremely languid.

A few days afterward the pain seized him again in the same place, and lasted many hours. Dr. P. then first expressed his apprehension that the disorder was gravel in the kidney. He opened a vein to relieve the present symptoms, took away blood freely, and by these means procured immediate ease. It was followed by the discharge of a little blood and some gravel along with the urine.

For several succeeding months attacks of the complaint came on at intervals, and always with extreme pain. Lime water was now prescribed, and taken freely for a great length of time, during which course the patient discharged occasionally fine gravel, and once, after severe exercise, in considerable quantity mixed with blood.

In the winter of 1812—13, his disorder had reached an alarming height. He had fits of it every two or three days, and sometimes twice a day. The paroxysms were in general so violent, that he involuntarily writhed in the utmost torture while they lasted. The pain had always its seat in the region of the kidneys, sometimes on one, at other times on both sides. With his worst attacks there was a total suppression of urine for twenty-four, or even forty-eight hours, without any fullness of the bladder, or inconvenience felt in that organ; but at those times a cutting sensation was experienced along the course of the ureter, as if an angular grain of sand descended through that passage. Almost invariably before being seized with a fit he found it impossible to pass water, though strongly solicited, or, at most, could pass but a few drops, and that with extreme pain. Shortly after any attack subsided the urine came off very freely.

He was always conscious of the passing of the irritating matter into the bladder. That instant the pain ceased, and shortly afterward the urine flowed without interruption. It was then frequently tinged with blood, and always more or less charged with sabulous matter. Most part of this season was passed in such suffering: medicine afforded no relief, and was abandoned: a temporary ease was sought for in blood letting during the paroxysm, and the almost daily use of the hot bath, heated to a degree barely tolerable. The least inconvenience of such palliatives was to leave the patient exceedingly debilitated.

During all this period, the use of acids was carefully avoided: but finding the return of the paroxysms so very frequent, and experiencing no advantage that could be ascribed to lime water, the attending physician determined upon trying the effect of an opposite plan, and directed cider for the patient's drink. This course was likewise persisted in for a considerable time, though the injurious consequence of it was soon manifest and alarming. The pain was almost ceaseless, and the severer paroxysms occurred now very frequently. Under these circumstances the patient felt greatly discouraged. In him, regular habits and constant temperance seemed bereft of their usual good consequences. He was also free from any hereditary distemper, and naturally of a very robust constitution, without deriving from these things their accustomed advantages. One alleviation only accompanied his sufferings: ever since his nephritic attacks became severe and frequent, he was no longer molested by a periodical head-ach, that had afflicted him from his childhood.

Having been sufficiently admonished, by the aggravation of his complaint, to drop cider, he returned again to the use of lime water, and persevered in it for several months, with as little benefit as at first. At this time Dr. P. upon consulting with Dr. M. determined to change his medicine for carbonate of soda. He took this also a long while, and conjointly with it drank abundantly of supercarbonated soda water. Nevertheless, his disorder did not, at all, abate by any thing he had yet done.

In the spring of 1813, he was first advised to try the mineral water of Schooley's Mountain, which was then represented to him as beneficial in cases of gravel. He went there in the course of the summer, and remained about three weeks, but did not experience any decided advantage from his first visit. At the end of two weeks his urine appeared all of a sudden quite black, and remained dark coloured for about eight days. He has since found, during several after visits to the spring, that such a change of colour is a favourable symptom. But at that time business hurried him back too soon to the city; it was hoped, however, that magnesia, as yet an untried remedy, might be substituted for the waters, with, at least, equal advantage. The experiment did not answer the expectation; it must, at the same time, be acknowledged, that the magnesia did not get an equally fair trial with other medicines far less promising.

Early in the ensuing summer he again visited Schooley's Mountain. At the time of his arrival there he was extremely feeble, and three or four weeks passed over before he experienced any great mitigation of his principal complaint; but he found his strength and general health gradually to improve. In less than a month his urine began to be discoloured, it soon after became almost black, the waters operated as a powerful diuretic, and gradually his disorder gave way. The moment his strength would permit, by way of ascertaining the progress of his amendment, and from motives of pleasure as well as health, he began to take exercise, particularly on foot, and by labouring in the garden. All this he bore with a sensible and daily increased advantage. After a stay of three months he was able to support fatigue of every kind without inconvenience. He believed himself nearly, if not completely, cured, and in fact continued well for a much longer interval than upon any former occasion.

The quantity which he drank of the water, was from fifteen to twenty half pint tumblers a day. He had taken it at different seasons, and experienced similar effects from it, winter and summer; especially when he joined to its use exercise in the open air. But as wet and tempestuous weather always brought on attacks of his disorder, it was only when he had resided some weeks at the spring that he was ever proof against violent changes in the atmosphere. He finds that the beneficial influence of the water is not permanent, though, indeed, the longer he drinks of it, his intervals of ease are proportionably protracted. When he returns to his professional labours in this city, to late hours of writing and study, and adds to bodily inactivity a great deal of mental exertion, or experiences from any source whatever, much anxiety of mind during the same period, the suspended assaults of his distemper are speedily renewed with no less severity than ever. As those causes must have operated against the beneficial effect of all the medicines he took at any time in town, their insufficiency in his case cannot, in fairness, be considered to detract from the character they may have acquired on other occasions. The patient having convinced himself, at last, that a transition from a sedentary to an active life, was the thing most important, perhaps, to his recovery, he has fixed his residence out of town, where he avails himself of the opportunity of exercise afforded by a garden of considerable extent, and a long walk daily to and from his office. In this rural retreat for bodily exercise, and mental relaxation, and from which all books and papers are scrupulously excluded, Mr. H. drinks ad libitum, of a carbonated chalybeate which I directed to be prepared for him. It is made in a strong iron bound vessel containing several gallons of pure water, into which there are introduced a few coils of clean iron wire. Carbonic acid gas is then propelled through the water by means of a forcing pump, after the manner employed in the manufacture of soda water. This artificial chalybeate contains, it is true, much more carbonic acid gas than the natural chalybeate of Schooley's Mountain. The difference, however, renders the artificial more palatable, and to him not less efficacious, than the natural water. It has already produced the same sensible effects. It equally blackened the urine, increased its quantity, and in other respects the patient experienced the same relief from it as from the water of the spring.

It will be remarked, that when Mr. H. first visited the spring, he was there three weeks without experiencing any material alleviation of his disorder; the cause of which seems to be, that he was then too weak to go much abroad, so as to unite exercise with the use of the water, and that his stay there was too short. But that sort of change had already commenced, which many subsequent instances showed to be immediate precursors of a solution of the existing morbid state. It appears, from the history of the case, that collections of sabulous matter take place in the patient's kidneys during any considerable interruption of the chalybeate, especially if, at the same time, he applies himself closely to his professional avocations. It is equally established, that the chalybeate acts upon the sabulous matter; for this is, at length, evacuated along with the urine which it blackens, and the dark colour, as well as the discharge of sand, continues more or less, according as the previous disuse of the water has been longer or shorter. If, after this, the mineral water be persevered in, it prevents the formation of any new concretions, for the discharge of the dark sediment ceases, the urine returns to its natural colour, and there is no new nephritic symptom.

Such is the course invariably experienced by the patient at the spring, where air and exercise, and a vacant mind go hand in hand, with the drinking of the chalybeate: but in the city where, in spight of the physician's remonstrances, profitable business occasionally forces him to longer sittings, greater application, and stronger exertions than are compatible with the delicacy of his health, he still has an attack at distant intervals, though comparatively so slight, that it scarcely deters him from the indulgence of books and study. A speech of two or three hours in court, or any vehement affection of mind, will bring on a paroxysm as readily as would a thorough wetting, or a fortnight's confinement.

This seems to be one of those cases that proves the superior efficacy of air and exercise, and moral treatment, in a chronic disease, to any other remedy whatever. Even the salutary effects of that medicine which proved most beneficial, must appear to have been derived, in a very subordinate degree, from its purely medical qualities. I administered carbonate of iron, combined with large dilution, to the patient, during his sedentary period, without warding off, or apparently mitigating his complaint; but, at this very interval, a visit to his father's farm on Long Island, and leading there a farmer's life for some weeks, was followed by a remission of his disorder. Nevertheless, to the iron contained in the Schooley Mountain water, must be ascribed some portion of the relief procured. When the chalybeate is drank for some days after the worst attacks, it evidently effects a change in the state of the kidneys, and in particular, appears to find there, and to combine with, a portion of sulphur, with which it forms a sulphuret, distinguishable by its black colour. This unusual quantity of sulphur in the urine seems to be connected with the morbid condition of the kidneys, for its evacuation is a sure precursor of amendment, and during the further continuance of the water, the accumulation of gravel and sulphur is, if not altogether, at least very much lessened.

The calculous affection of this patient was constantly aggravated by acescent food and acid drinks, and therefore appears to be owing to a deposition of uric acid, which admits of being precipitated within the body by the superior affinity of a stronger acid for its base. One cause, undoubtedly, of his being better of late, is the careful avoidance of every acid drink.

Another property of the Schooley Mountain water is, that the carbonic acid it holds is altogether in a state of combination, and this accounts for its never occasioning flatulence, or spasm, in the weakest stomach, at the same time that it gradually strengthens the digestive

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powers like other chalybeates. The mineral waters of Vichy, in France, are a hot chalybeate, and do excellent service in nephritic complaints. The waters of Cheltenham and Scarborough, in England, in addition to iron, contain a considerable portion of sulphate of soda, which helps to render them diuretic, as well as purgative, and eminently serviceable in dyspepsia. I have also combined occasionally with the artificial chalybeate prepared for Mr. H. a dose of Glauber. A half tumbler of the solution of this salt, is filled up from the fountain containing the chalybeate: by the use of this he has the advantage of increasing the quantity of urine, correcting the habitual tendency to costiveness, and increasing, upon the whole, the good effects of the water.

Owing to a variety of provoking accidents, I have not been able, as yet, to make any analysis of the matter discharged; frequently, what had been collected for a few days, at my earnest solicitation, was then thrown away, through the effect of a preposterous cleanliness, or an incurious neglect.

New-York, July, 1815.

CIRCULAR LETTER

OF

THE LITERARY AND PHILOSOPHICAL SOCIETY,

OF NEW-YORK,

ON THE SUBJECT OF

A STATISTICAL ACCOUNT OF THE STATE OF NEW-YORK.

New-York, February 15, 1815.

Sir,

The Literary and Philosophical Society of New-York, (which was incorporated at the last Session of the Legislature, and which was instituted to cultivate the most useful branches of knowledge, to stimulate into activity the literature and talents of the community, and to obtain a mass of information, which may have a tendency to elevate the literary character, and subserve the best interests of our country,) are desirous of collecting materials for a statistical account of the United States, and more particularly of the State of New-York. With this view, they respectfully solicit your prompt and pointed attention to the following subjects, or to such of them as you are conversant with, or as may fall within the range of your observation.

1. The name, (and its origin,) of the town or county in which you reside; its situation, extent, and number of acres; the history of its settlement; the number, general character, and condition of the first settlers, and from what part of the world; the circumstances and causes of the settlement; the time of their arrival; the encouragement and authority under which they came; by what means the lands were

obtained from the Indians, whether by conquest or purchase; and the nature of the grants or patents of land; the government from whence they proceeded; the latitude and longitude of any remarkable place in your county.

2. The Indians that formerly inhabited your town or county; their number, condition, customs, manners, language, mythology, battles, burying places, monuments, forts, weapons, utensils, and any other traces of their settlement; their history, migrations, traditions, character, trade, controversies, wars, and treaties; their names of places, and the signification, and their present state.

3. Nature of the soil, mountains, hills, valleys, plains, caverns, rocks, lakes, ponds, rivers, islands, streams, cataracts, mineral and medicinal springs, aqueducts; the changes in mountains, lakes, rivers, and streams; the quality of water; the nature and composition of rocks, and their position; whether in strata or otherwise; inclined, or horizontal; the strata observed in digging wells; petrifications, shells.

4. Mines, minerals, fossils, quarries of stone, and particularly flint, slate, soap-stone, marble, lime-stone, marl, gypsum, sulphur, iron, copper, lead, silver, plumbago, salt, nitre, and ochres of various kinds; their distance from navigable water.

5. Trees of different kinds, and their uses for ornament, fuel, fences, house and ship building; the original growth of wood, and the variations on successive cuttings; whether plenty or scarce, increasing or decreasing, and the causes; the best means of increasing the quantity, and improving the quality.

6. Beside wood, other fuel, such as coal, turf or peat; the quantity and quality of each; distance from navigable water; increase or decrease, and price of the different kinds.

7. The state of agriculture; the price of land, of provisions, and of labour; the kinds of grain produced, quantity on an acre, and total

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quantity in each year; the quantity of grain, meal, and flour exported; the quantity of flax and hemp raised and exported; the most approved and profitable mode of cultivating those productions; value of articles consumed at home; quantity and value of the whole produce.

8. The native and imported grasses; the quantity of each kind produced on an acre; the proportion of meadow to arable lands; the improvement of the country by irrigation, draining and diking.

9. Manures; the different kinds, and their effects; the best time and mode of applying and increasing them, and of preparing them for particular crops.

10. The best seed time, and harvest time; the best time and mode of preparing lands for seed; of extirpating weeds, and of preserving grains from insects; the effects of a change of seeds; the most approved rotation of crops; remarkable instances of good and bad seasons; unusual failure of crops; the known or supposed causes, and the temperature of the seasons at the time.

11. Fences; the materials and modes of erecting them; the best modes of improving them, and the introduction of substitutes for those used; modes of cultivation; implements of husbandry; teams.

12. Number of sheep, swine, neat cattle, and horses; and the best mode of multiplying and improving them, and of preventing their destruction from disease or other causes.

13. Fruit trees, and esculent vegetables; the best kinds, and best modes of improving, cultivating, and preserving them; the state of gardening; the quantity and quality of cider, beer, wine, and spirits made, and how made.

14. The state of manufactures; the kinds, quantity, and quality made in families, and manufactories; the history of any useful manufacture, including its increase and decline, and the causes; the quantity, quality, and value of articles manufactured for domestic use, and for

sale abroad; useful machines for abridging labour, and improving manufactures.

15. The state of the highways; common and turnpike roads, and bridges; harbours, ferries, banks, villages, towns and cities, and their police.

16. Trade and commerce; quantity, and kinds of foreign articles consumed; amount of exports and imports; the history and state of boat and ship building; the number of boat-men and seamen, and of ships and vessels of different kinds.

17. Fisheries: the kinds, quantity, and value of fish; the mode of curing and taking them, and the market; an account of the different species of fishes in streams, rivers, ponds, lakes, and salt water.

18. Wild animals now, or hereafter known; their increase or decrease, and the cause; serpents, tortoises, and other amphibious animals; quadrupeds, insects, or bones of the animal called the mammoth, or of any other unknown animals.

19. An account of birds, whether migrating or resident; the periods of their arrival and departure; their habitudes and uses.

20. Natural history of plants, and their kinds, whether noxious or useful, native or naturalized; time of introduction; their progress, qualities, and diseases, and the best mode of extirpating those which are injurious.

21. Climate: the effect of clearing and cultivation on climate; meteorological observations; marriages and births; bills of mortality; longevity; histories of epidemic maladies; diseases among men and other animals; crimes, suicide.

22. The state of the learned professions; of morals; of religion, and of learning; the number of academies and schools, how supported, and the mode of instruction; charitable institutions; humane and literary associations: improvements in arts and sciences; inventors of

curious machines; useful discoveries; distinguished characters; printing presses; book stores; public libraries; scarce books; valuable manuscripts; customs and manners; the progress of luxury.

23. The state of population at different periods, and in reference to the place of birth, age, religious persuasion, occupation, and residence, whether in town, village, or country; the number of houses.

24. The militia: their numbers, organization, arms, ammunition, and mode of equipment; arsenals, magazines, powder-mills, founderies, fortifications.

25. Mendicity: the condition of the poor, and the expense and mode of supporting them; alms-house, hospitals, penitentiaries; the state of slavery.

26. Taxes, the amount, and kinds, paid for the use of the town, county, state, and United States; the public buildings, and other public improvements; the income and expenditures of incorporated villages and towns; the sources and objects.

27. Antiquities, whether aboriginal or colonial; curiosities, whether natural or artificial; drawings and descriptions, of whatever is interesting in those respects, especially of ancient fortifications and tumuli, ascertaining the materials composing them; their contents, and the purposes for which they were probably designed.

28. Meteors, comets, eclipses, earthquakes, tornadoes, tempests, inundations, volcanic eruptions, seasons of extreme heat and cold, or other remarkable events in the natural world; the present variation of the magnetic needle, and what it has been formerly, and at what places observed.

29. Miscellaneous observations not comprehended in the above.

You will, Sir, at once perceive the important and comprehensive view which the society intend to take of the state of the country; it will embrace whatever relates to our climate, soil, cultivation, husbandry, manufactures, commerce, education, learning, population, occupations, police, manners, morals, religious principals, geography, history, geology, mineralogy, zoölogy, botany, and diseases ; it proposes to examine, with anatomical accuracy, the internal structure of society, to illustrate that most important science, political philosophy, and to collect such useful and practical information on the various subjects connected with individual and social prosperity, as may have a tendency to promote the solid and permanent interests of America.

Sir John Sinclair published a statistical account of Scotland, drawn up from the communications of the ministers of the different parishes, made to him in consequence of a variety of queries circulated among them, for the purpose of elucidating the natural history and political state of that country. Scotland is divided into nine hundred and fifty parochial districts ; in less than eighteen months from the time of circulating the queries among the clergy, reports were received from above one half the number ; in three or four years the whole work was completed, and it has been emphatically said of this great survey, "that no publication of equal information and curiosity, has appeared in Great Britain since Doomsday-book, and that from the ample and authentic facts which it records, it must be resorted to by every future statesman, philosopher, and divine, as the best basis that has ever yet appeared for political speculation."

This state contains forty-seven counties, and above five hundred towns ; we are persuaded that every town contains a sufficient number of intelligent men, to furnish the information required, and that nothing more is necessary than for them to devote to this important subject those few hours which can always be spared from the ordinary occupations of life. The state is atlantic and western : it borders on the ocean, and some of the great lakes ; the greatest rivers in North America flow, and vast chains of mountains pass through it. In extent,

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population, commerce, opulence, and power, it stands at the head of the Union ; and it is believed that no country in the world furnishes more fertile subjects for the researches of the naturalist, the investigations of the philosopher, and the speculations of the politician.

By order,
And in behalf of the Society.
(Signed) DE WITT CLINTON, PRESIDENT.

N. B. Specimens of Minerals, and other subjects of Natural History, will be thankfully received and reposited in the Cabinet of the Society.

⁂ *Please to transmit your answer to this Letter by a safe private conveyance, directed to the Hon.* DE WITT CLINTON, *Dr.* DAVID HOSACK, *or the Rev. Dr.* JOHN M. MASON, *New-York, or the Hon.* JAMES KENT, *Albany.*

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